QUALITY AND FERTILITY OF SOIL RESOURCES FROM SOME PROTECTED FOREST ECO-SYSTEMS FROM N-E OF ROMANIA

CALITATEA ŞI FERTILITATEA RESURSELOR DE SOL DIN UNELE ECOSISTEME FORESTIERE PROTEJATE DIN N-E ROMÂNIEI

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Abstract. *Eutric gleysol from forest eco-system of Balta Academiei-Berheci-Vaslui, generally has good quality properties, except soft texture and very hard summery consistency of the dry soil (excessive values) and small aeration porosity (limiting values). Ecological specificity data sheet shows low values of precipitations and relative air humidity for summer period, which provide low favorability. The level of biological activity is medium at the surface and low on the soil profile. Potential and effective trophicity have medium, respectively low values for the forestry vegetation.*

Key words: quality, fertility, ecological specificity, ecological favorability, forest eco-system

Rezumat. *Gleiosolul eutric din ecosistemul forestier de la Balta Academiei-Berheci-Vaslui are, în general, însuşiri bune de calitate, cu excepţia texturii fine şi a consistenţei estivale a solului foarte dură în stare uscată (valori excesive) şi a porozităţii de aeraţie mici (valori limitative). Fişa specificului ecologic arată valori scăzute ale precipitaţiilor şi umidităţii relative a aerului pentru sezonul estival, care asigură o favorabilitate scăzută. Nivelul activităţii biologice este mijlociu la suprafaţă şi scăzut pe profilul solului. Troficitatea potenţială şi efectivă au valori mijlocii, respectiv scăzute pentru vegetaţia forestieră*

Cuvinte cheie: calitate, fertilitate, specific ecologic, favorabilitate ecologică, ecosistem forestier

INTRODUCTION

Quality and fertility of soil resources represent integrative features of structural and functional components of the biotope, in the terrestrial ecosystem unit, in reciprocal and reversible ratio with regional and local specific ecological elements (Bireescu and co., 2010; Carter, 2002, Montanarella, 2008).

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Wander and co., 2002 considers that the notion of soil quality includes both soil trophicity (productivity) and environmental possibilities.

Seybold and co., 1996, Grant, 2002; Karlen and co., 1997 and Doran and co., 2000, characterize the notion of quality as a soil ability, as biological system, to provide conditions for biological activity, storage, recycling and mobilization of nutrients.

Biological potential of soil resources characterizes their fertility state and emphasize the stressful and limitative or excessive impact of local and regional environmental factors, as well as of various residual pollutants and anthropogenic factor (Ştefanic et al., 2006; Bireescu, 2001; Dorneanu et al., 1976; Januszek, 1999; Nanipierri et al., 2002).

MATERIAL AND METHOD

Ecopedological and pedobiological researches were performed in the forest eco-system of oak and ash from Balta Academiei – Berheci (Vaslui). Researches focused on soil and biological analysis carried out in field and laboratory on genetic horizons of soil profile of eutric gleysols (SRTS, 2003, respectively eutric Gleysols, WEB, 2006).

There were analyzed by the matrix sheet of regional and local ecological specificity, the main 20 climatic and edaphic ecological factors and determinants, from quantitative point of view, by 4 ecological size classes (small, medium, large, excess) and from qualitative point of view, by 4 ecological favorability classes (low, medium, high and very high). The 20 main ecological factors and determinants that we analysed are: 3 growing factors (total nitrogen content - Nt, mobile phosphorus content - PAL and mobile potassium content KAL), 5 climatic factors (average annual temperature, average annual precipitations, wind regime, summery precipitations and relative humidity of summery air), 2 space and time ecological factors (edaphic volume, bioactive period), 2 negative ecological factors (alkalinity/acidity, summery consistency of dry soil), 5 pedoecological determinants (texture, reaction, aeration porosity, humus, base saturation degree), one synthetic pedobiological determinant and 2 pedological synthetic quality indicators (potential and effective trophicity). Biological activity is analysed by dehydrogenase activity indicator (Cassida – Kis method)

RESULTS AND DISCUSSIONS

The analysis of physical, chemical and biological main quality indicators on genetic horizons is presented in table 1:

- soil reaction is neutral – weak alkaline (6.56 – 7.42 pH units);
- soil texture is soft, undifferentiated on soil profile, with values of colloidal clay content varying between 42.3-45.2%;
- aeration porosity (AP) has low values, varying from 11% at the soil surface to 6% in depth;
- summery consistency (SC) of the dry soil has excessive values (is very hard);

- organic matter content (Hum) has medium values ranging from 7.16% at the surface and 3.56% in profile;
- total nitrogen content (Nt) has medium values (0.253-0.216 %);
- mobile phosphorus content (PAL) has high values (73-51 ppm);
- mobile potassium content (KAL) has medium values (207-121 ppm);
- total capacity of cation exchange (T) has medium values (27.3 – 14.3 me)
- the degree of base saturation (V) has high values (100%);
- dehydrogenase activity (DA), as a synthetic biological indicator has medium values (20.61 mg TPF) in the first 15 cm and low (15.33 to 10.11 mg TPF) in depth, correlated with the high clay content and an air-water deficient regime

Table 1

Main physical, chemical and biological characteristics of the eutric Gleysol

Horiz./ depth cm	Quality and fertility indicators										
	% clay	AP %	SC	pH	Hum %	Nt%	PAL ppm	KAL ppm	T me	V %	DA mg TPF
Am 0-15	42,3	11	very hard	6.86	7.16	0.253	73	207	27.3	100	20.61
Am 15-25	45,2	9	very hard	6.56	3.62	0.216	51	153	24.6	100	15.33
Ago 25-45	43,6	8	very hard	6.75	3.56	0.095	36	144	18.1	100	10.11
Cgo 45-65	42,8	6	very hard	7.42	0.73	0.041	44	121	14.3	100	2.41

Table 2 presents the synthetic matrix sheet of regional and local ecological specificity, that analyse the main 20 ecological factors and determinants, by size classes from quantitative point of view and by ecological favorability classes from qualitative point of view.

Table 2

The matrix sheet of regional and local ecological specificity

Ecological factors and determinants	Ecological size classes				Ecological favorability classes			
	small	medium	large	excess	low	medium	high	very high
Ecological growing factors								
Total nitrogen Nt %		X				0		
PAL ppm			X				0	
KAL ppm		X				0		

Ecological climatic factors								
Average annual temperature			**X**					**0**
Average annual precipitations		**X**					**0**	
Wind regime		**X**					**0**	
Summery precipitations	**X**				**0**			
Relative humidity of summery air	**X**				**0**			
Space and time ecological factors								
Edaphic volume	**X**				**0**			
Bioactive period			**X**					**0**
Negative ecological factors								
Alkalinity/Acidity	**X**						**0**	
Summery consistency of dry soil				**X**	**0**			
Ecological determinants								
Organic matter%		**X**					**0**	
Texture				**X**	**0**			
Aeration porosity	**X**				**0**			
Soil reaction			**X**					**0**
Base saturation degree			**X**					**0**
Synthetic biological indicator								
Dehydrogenase activity		**X**					**0**	
Synthetic ecopedological indicators								
Potential trophicity			**X**				**0**	
Effective trophicity		**X**				**0**		

The analyse of soil quality and fertility in regional and local ecological context from Moldavian forest steppe emphasizes the following significant aspects:

- most of the 20 climatic and edaphic ecological factors and determinants fit, from quantitative point of view, in medium and large size classes;

- in the small ecological size class fit: aeration porosity, small edaphic volume and also the low levels of summery precipitations and summery air humidity;

- in the excess ecological size class fits the soft texture (clay) together with the very hard summery consistency of the soil;

- most climatic and edaphic ecological factors and determinants fit, from qualitative point of view, in medium and high ecological favorability classes for oak and ash forestry vegetation;

- in the low ecological favorability class fit summery precipitations, summery air humidity, aeration porosity, summery consistency, texture and edaphic volume;

- in the very high favorability class fit: average annual temperature, bioactive period, base saturation degree and soil reaction.

CONCLUSIONS

1. The ecological soil interpretation, in the regional and local ecological context, emphasizes the qualities, deficiencies and excesses background of soil resources affected by an air-water deficient regime.

2. Most physical, chemical and biological indicators of soil quality ensure a high trophic potential background for oak and ash forestry vegetation.

3. Soft texture, very hard summery consistency of dry soil, low aeration porosity, excessively dry summer represent limitative and stressful factors that do not allow the complete exploitation of the high trophic potential background.

4. Biological activity has medium values, although the soil is well supplied in humus and nutrients, this because of the air-water deficient regime and the presence of the groundwater at the base of soil profile.

5. Although potential trophicity is high, however biocoenosis can not fully exploit the soil reserve; effective trophicity level for plants is medium.

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