ECO-PEDOLOGICAL AND PEDO-BIOLOGIC DYAGNOSIS OF SOME MEADOWS ECO-SYSTEMS FROM N-E AREA OF ROMANIA

DIAGNOZA ECO-PEDOLOGICĂ ŞI PEDO-BIOLOGICĂ A UNOR ECOSISTEME PRATICOLE DIN NE ROMÂNIEI

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Abstract. *Mollic Gleysols from pasture ecosystem Balta Academiei-Berheci Vaslui has a high fertility and quality that cannot be fully manifested in the ecological context due to the excessively droughty summer season and defective air-water system. Eco-pedological diagnosis of soil effective trophicity pointed out a high trophic potential (76 points) on 0-20 cm depth and a medium trophic potential (57 points) on 20-40 cm depth. The matrix of pedo-biological diagnosis pointed out a good fertility (76 points) on 0-20 cm depth and a medium fertility (46 points) on 20-40 cm depth.*

Key words: pasture ecosystem, eco-pedological diagnosis, pedo-biological diagnosis, effective trophicity, fertility

Rezumat. *Gleiosolul cernic din ecosistemul praticol Balta Academiei-Berheci Vaslui are un potenţial de fertilitate şi calitate ridicat, care nu se poate manifesta pe deplin în contextul ecologic, datorită sezonului estival excesiv de secetos şi regimului aerohidric defectuos. Diagnoza eco-pedologică a troficităţii efective a solului evidenţiază un potenţial trofic ridicat (76 puncte) pe adâmcimea 0-20 cm şi un potenţial trofic mijlociu (57 puncte) pe adâncimea 20-40 cm. Matricea diagnozei pedo-biologice evidenţiază o fertilitate bună (76 puncte) pe 0-20 cm şi mijlocie (46 puncte) pe 20-40 cm.*

Cuvinte cheie: ecosistem praticol, diagnoză eco-pedologică, diagnoză pedo-biologică, troficitate efectivă, fertilitate.

INTRODUCTION

As part of ecosystem, between biotope and biocenosis they achieve reversible and permanent changes of substances, energy and information, which determines the stability or instability of natural and anthropogenic ecosystems (Andrews et al., 2004; Bireescu et al., 2005). Through the soil interconnections with external environmental conditions provides some systemic properties of the soil, completeness and stability, with decisive role on soil microbiota. The ability of ecosystems to produce biomass is the result of active, permanent and reversible interaction of the soil with biocenosis and climatic factors as environmental specific elements (Bireescu, 2001, 2010; Cârstea, 2001, Montanarella, 2008). Soil ecological interpretation defines, from quantitative and qualitative point of view,

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the two objective and important characteristics of the soil: the trophic potential and the ecological specific which the soil can occur completely or limiting. The diagnosis of soil quality and fertility provides an overview on trophic and fertility soil potential with a view the monitoring of its quality and fertility indicators and the environmental status for ecological rehabilitation of soil resources (Mausbach, 1996; Karleen et al., 1997; Bremer et al., 2004; Bireescu et al., 2008, 2010).

MATERIAL AND METHOD

The ecological researches were conducted on gleysol (Hidrisols class, SRTS 2003; Gleysols, WRB, 2006) from pasture ecosystem Balta Academiei-Berheci (Vaslui county), grassland meadow. There have been tests and measurements of soil profile, on the genetic horizons, both in the field and laboratory, on some indicators of quality and fertility, according to the ICPA methodology, 1987. Based on analytical datum were prepared the matrix files of eco-pedological diagnosis of effective trophicity of soil resources (EPDETSR). EPDETSR, as comprehensive ecological indicator of quality soil content was obtained by the sum of gave scores, according to the reliability scale with values from 1 to 10, for each of the 10 main analised quality indicators, using formula:

$$\text{EPDETSR} = \sum_{1}^{10}(Tx + Con + pH + BS + SOM + Nt + P + K + PA + BSI)$$

where: Tx – soil texture; Con – hard soil consistency; pH – soil reaction; BS – base saturation; SOM – soil organic matter content; Nt – total nitrogen content; P-exchangeable phosphorus content; K - assimilable potassium content; PA –air porosity; BSI–Biological Synthetic Indicator. The sum of the gave scores varies between 10 points (low effective trophicity, oligo-trophic soil) and 100 points (very good effective trophicity, mega-trophic soil). Pedo-biological diagnosis of soil fertility (DIPEBIOS) was obtained by the sum of gave scores for each of the 10 biological synthetical indicators (Ştefanic, 1994; 1999), using formula:

$$\text{DIPEBIOS} = \sum_{1}^{10}(R + C + K + I + U + P + DA + IVAP + IEAP + BSI)$$

where: R – soil respiration; C – soil cellulosolysae; K – catalase; I – invertase; U – urease; P – total phosphatase; DA – dehydrogenase activity; IVAP – Indicator of Vital Activity Potential; IEAP - Indicator of Enzymatic Activity Potential; BSI – Biological Synthetic Indicator.

The sum of the gave scores varies between 10 points (very low biological activity; very low fertility) and 100 points (very good biological activity; very high fertility).

RESULTS AND DISCUSSIONS

In table 1 we pointed out the main physical and chemical properties on genetic horizons of the soil profile:

- soil texture is fine (medium argillaceous earth TT) undifferentiated on the soil profile (38,8 – 44,6% colloidal clay).
- air porosity has low values on soil profile, beginning from surface (10% on 0-10 cm depth) and decreases on soil profile until 7%;

Table 1

The main physical and chemical properties of soil resources from pasture ecosystem Balta Academiei-Berheci Vaslui

Stationary	Depth (cm)	EC (ms/cm)	Colloidal clay (%)	Texture	PA (%)	Con.	pH_{H2O}	SOM (%)	Nt (%)	P_{AL} (ppm)	K_{AL} (ppm)	SB (me)	T (me)	BS (%)
Berheci Vaslui Balta Academiei grassland meadow *Gleysols*	Aţ 0-10	0.56	40.5	TT	10	very hard	7.21	8.21	0.275	68	226	28.3	30.8	95
	Am 10-20	0.47	44.6	TT	8	very hard	6.83	5.63	0.254	56	201	26.5	28.1	99
	ACGo 20-40	0.36	38.8	TT	9	very hard	6.66	2.71	0,101	45	153	16.3	16.3	100
	CGr 40-70	0.51	41.5	TT	7	very hard	7.01	1.16	0.063	50	116	10.6	10.6	100

Table 2

Biological activity of soil resources from pasture ecosystem Balta Academiei-Berheci Vaslui

Staţionar	Depth (cm)	Biotic Indicators		Enzymatic Indicators				Synthetic Indicators			
		R (mg CO_2)	C (% celuloză	K (cmc O_2)	Sugar (mg glucose)	U (mg NH_4)	P (mg P)	IPAV (%)	IPAE (%)	ISB (%)	DA (mg TPF)
Berheci Vaslui- Balta Academiei- grassland meadow *Gleiosol cernic*	0-20	44,61	45,01	431	1216	18,42	6,14	37,37	18,67	28,02	23,14
	20-40	22,11	23,42	206	586	8,74	2,81	19,08	8,91	13,99	11,83

- very hard summer consistency on soil profile.
- soil reaction is favourable, having neutral – low acid values (7,21 pH unities at surface and 6,66 pH unities on 20-40 cm depth).
- soil organic matter content has high values at surface (8,21% on 0-10 cm and 5,63% on 10-20 cm) then decreases on soil profile.
- the content of nutrients (N, P, K) has high values, especially at surface.
- the amount of exchange bases and cation exchangeable capacity have high values, especially at surface.
- base saturation has high values, the soil being eutrophic.

In table 2 we pointed out the main synthetic fertility indicators from gleysol belonging pasture ecosystem Berheci Vaslui.

Soil is a living space and whole its activity of genesis, developing and evolution carried out under action of biological factor. As a result of biological activity the soil acquires fertility (Bireescu, 2001, 2010; Ştefanic, 2006).
- soil respiration has high values on depth of 0-20 cm (44,61 mg CO_2) and significantly lower values, up to 50% for depth of 20-40 cm (22,11 mg CO_2);
- cellulosolysae has high values on the surface (45,01% celluloses) and significantly lower, by 50% at 20-40 cm (23,42% degraded celluloses);
- the catalysis potential has high values (431 cmc O_2) at a depth of 0-20 cm and significantly lower, by 50% at 20-40 cm (206 cmc O_2);
- the sugar breakup potential has high values (1216 mg glucose) for a depth of 0-20 cm and significantly lower, by 50% at 20-40 cm (586 mg glucose);
- the urease breakdown has high values (18,42 mg NH_4) for a depth of 0-20 cm and significantly lower, by 50% at 20-40 cm (8,74 mg NH_4);
- the total phosphatase has high values (6,14 mg P) at a depth of 0-20 cm and significantly lower, with more than 50% at 20-40 cm (2,81 mg P);
- the Vital Activities Potential Indicator (IPAV) has average to high values (37,37%) for a depth of 0-20 cm and significantly lower, by 50% at 20-40 cm (19,08%);
- the Enzymatic Activities Potential Indicator (IPAE) has average values (18,67%), for a depth of 0-20 cm and significantly lower, by 50% at 20-40 cm (8,91%) correlated with the deficient aerohydric regime;
- the Synthetic Biologic Indicator (ISB) has average values (28,02%) for a depth of 0-20 cm and significantly lower, by 50% at 20-40 cm (13,99%);
- the dehydrogenase activity has average values (23,14 mg TPF) on a depth of 0-20 cm şi and significantly lower, by 50% at 20-40 cm (11,83%).

In table 3 we present the analytic and synthetic values for 10 main quality and fertility indicators, as well as the marks awarded for the two depths (0-20 cm and 20-40 cm). Thus, by summing up the awarded marks, we get 76 points, which indicates a high effective trophicity, at a depth of 0-20 cm. For the depth of 20-40 cm we have 57 points, which indicates an average effective trophicity.

In table 4 we present the matrix of the pedo-biological diagnosis (DIPEBIOS) of the fertility of the Mollic Gleysols from the pasture ecosystem Balta Academiei-Berheci area.

Not only soil respiration, but also the dehydrogenasic activity are quantified with 8 value points on 0-20 cm and 6 value points at 20-40 cm. Catalasys, sugar breakdown and phosphatase, as well as IPAV, IPAE and ISB are quantified with 8 value points for 0-20 cm and 4 value points for 20-40 cm. The added value of the partial marks is 76 points for

0-20 cm, which indicates a good biological activity, and for the 20-40 cm depth, the added value of the partial markes is 46 points, indicating an average biological activity.

Table 3

The matrix of the eco-pedological diagnosis (DEPTERS) of the effective trophicity of mollic gleysol from the pasture ecosystem of Academiei-Berheci Vaslui

Fertility indicators	Depth 0-20 cm	Mark (value points)	Dept 20-40 cm	Mark (value points)
Soil texture	40,5	4	44,6	2
Estival consistency	Very hard	4	Very hard	4
Soil reaction	7,21	10	6,83	10
Base saturation degree	95	10	99	10
Humus content	8,21	8	5,63	6
Total azoth content	0,275	10	0,254	6
Mobile phosphorus content	68	10	56	6
Assimilable potassium content	226	10	201	8
Aeration porosity	10	4	8	2
Synthetic biologic indicator	28,02	6	13,93	3
eco-pedological diagnosis (points) (DEPTERS)	-	**76**	-	**57**
	-	**High effective trophicity**	-	**Average effective trophicity**

Table 4

The matrix of the pedo-biological diagnosis (DIPEBIOS) of the fertility of the Mollic Gleysols from the pasture ecosystem Balta Academiei-Berheci Vaslui area

Fertility indicators	Depth 0-20 cm	Mark (value points)	Depth 20-40 cm	Mark (value points)
Respiration (mg CO_2)	44,61	8	22,11	6
cellulosolysae (% cellulosis)	45,01	8	23,42	6
Catalasys (cmc O_2)	431	8	206	8
Sugar breakdown (mg glucoses)	1216	8	586	4
Urease (mg NH_4)	18,42	8	8,74	4
Total phosphatase (mg P)	6,14	8	2,81	4
IPAV (%)	37,37	8	19,08	4
IPAE (%)	18,67	6	8,91	4
ISB (%)	28,02	6	13,99	4
Dehydrogenasic activity - mg TPF	23,14	8	11,83	6
pedo-biological analysis (points) (DIPEBIOS)	-	**76**	-	**46**
	-	**Good biological activity**	-	**Average biological activity**

CONCLUSIONS

1. The quality and fertility of the soil resources represent synthetic and integrating characteristics of the structural and functional components of the biotope, correlated with the zonal and local ecological particularities. The impact of the ecologic,

weather and antropic factors of the studied soil, the main ecologic factors and determiners because of their lacking or low values being the low level of estival rains, the aeration porosity, the aerohydric regime and the low edaphic volume. The main ecological factors and determiners in excess are the hard estival consistency, the fine texture of the soil and the compaction of the soil due to grazing.

2. The analysis of the main fertility indicators indicates a good biological activity (76 points) at 0-20 cm and an average one for 20-40 cm (46 points).

3. The analysis of the main quality indicators indicates a high effective trophicity at 0-20 cm (76 points) and an average one (57 points at 20-40 cm).

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