STUDY OF THE ECOPEDOLOGICAL CONDITIONS OF THE LANDS DEGRADED BY MINING EXPLOITAION WITHIN PERIMETER OF ROSIA COMMUNE, BIHOR COUNTY, ROMANIA

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Abstract: *A strong impact is manifested by the current mining exploitation on soil, putting it out of agricultural circuit for a period up to 15 years, which means important land, caused by mixture of different geological layers, natural migration of the nutritive elements through soil, acceleration of the erosion process, degradation of landscape, and instead of productive lands appear dumps (Nastea et al., 1980). The study area is a restricted area of land around the village Rosia. The natural flora of the surfaces affected by mining activities was completely destroyed and was largely installed a new type a vegetation different from the baseline.*

Key words**:** *bauxite lens, ecopedological conditions, vegetation, degraded lands, mining activity.*

INTRODUCTION

The research objective is located outside the built-up areas of Roşia commune, placed in the southern-eastern side of Bihor County, in the basin of river Crişul Negru. The name of Roşia seems to come from the red color of the soil rich in bauxite and iron oxide.

Extraction of bauxite within perimeter of Roşia commune has been realized by SC Bauxita MIN SA Dobreşti, activity suspended in September, 1999.

The bauxite deposit of the Mountain Pădurea Craiului is lens like, the lens of bauxite are located in the carst cavities of the palaeo-carst of superior chalk, and in the top side of bauxites appear Neocomian chalks with charaphytes, laid-down in the lacks which continued their development after the process of bauxite formation stopped.

The lands affected by mining exploitation have been affected by essential qualitative changes, their usage possibilities decreased, so is necessary to apply complex technologies to rehabilitate them.

Soil samples have been analyzed from the view point of pH, humus content, total nitrogen, phosphorus, and potassium.

As for the flora, this was studied separately per each waste dump and then we compared the floras of the studied waste dumps. The values of the indicators used in the case of categories of bioforms, geoelements, and ecologic indicators are those indicated by SANDA et al. (1983).

MATERIAL AND METHODS

The research methods of the flora in the studied perimeter consisted of repeated trips on site, opportunity to perform a series of measurements, determinations, as well photos, mainly related to vegetation and to the factors of other kind we encountered. The encountered species were determined using de work “Flora României” (Flora of Romania).

For the physical, chemical, mineralogical, biological, micromorphological etc. characterization, soil samples have been collected in order to analyze them in the laboratory, with specific methods. The number of soil samples and the sampling method depend on the kind and purpose of the analysis.

RESULTS AND DISCUSSIONS

Within Rosia commune are found lands unaffected by degradation, covered by herbaceous or forest vegetation specific to this zone, but also land surfaces affected by degradation caused by mining exploitation.

There are found lands degraded by deposit materials different as slope, exposition or physical properties. Other lands have been degraded by rock removal, compaction, surface or depth erosion, cogging.

Depending on nature and thickness, the bauxite is exploited underground or in micro-quarry. The spreading degree of bauxite lens is high, by 1-3 lentile/km². The size of lens highly ranges both underground and on surface.

The bauxite lens have been studied especially as texture and agro-chemistry, under aspects like soil reaction (pH), nitrogen, phosphorous and potassium supply, humus content, and proportion of soluble salts.

In table 1 are listed the chemical characteristics of the studied bauxite lens.

Table 1

Chemical characteristics of the studied degraded lands

Sample	Depth (cm)	pH	Total N %	Organic C	P %	K %	P (AL) mg/kg	K (AL) mg/kg
1	0-10	5.30	0.204	0.21	0.12	0.79	12	141
2	10-20	5.13	0.206	0.17	0.05	0.74	3.36	110
3	20-40	5.15	0.065	0.11	0.04	0.71	1.96	109
4	40-60	5.22	0.126	0.11	0.04	0.74	1.72	104
5	60-80	5.22	0.062	0.09	0.04	0.87	1.70	101
6	80-100	5.14	0.044	0.07	0.04	0.81	1.61	101

Regarding the texture, there were noticed high differences; the dump material has a heterogeneous texture, which shows that this material has been lowly or not at all homogenized (table 2).

Table 2

The content of heavy metals of the studied degraded lands

Sample	Depth (cm)	Co mg/kg	Cd mg/kg	Cu mg/kg	Fe mg/kg	Pb mg/kg	Mn mg/kg	Ni mg/kg	Zn mg/kg
1	0-10	23.1	0.17	18.6	2.91	23.9	432	30	81
2	10-20	16.3	0.13	23.7	3.53	13.3	382	30	108
3	20-40	14.2	0.13	22.1	3.40	17.2	366	32	89
4	40-60	17.6	0.26	20.4	3.66	24.5	442	32	87
5	60-80	17.7	0.13	23.7	3.58	30.4	507	37	146
6	80-100	21.8	0.65	21.0	3.51	32.5	709	36	88

The soil reaction of the studied area ranges from low acid to low alkaline, the value of pH was 5.3 in the top 10 cm of the bauxite lens and 6.15 in pasture close to bauxite lens.

The supply degree with nitrogen, phosphorous and potassium was very low in the studied lens of bauxite.

The structure of plant species living on the studied lens of bauxite is heterogeneous, predominant are the species with low requirements for life factors, plants considered to be extremely rustic but in the same time pioneer species too.

The statistic study considering the categories of bioformes highlights that hemicryptophites (H) hold 58,33% and are represented by species like:. *Rumex acetosa* L., *Centaurea phrygia* L., *Festuca pratensis* Huds., *Poa pratensis* L., *Holcus lanatus* L.. The other bioformes are lowly represented: annual therophytes (Th) 5,56%, mezophanerophytes (M) 5,56%, geophytes (G) 5,56%, and the rest of categories 2,78% .

Table 3

The statistic of plant bioformes

Bioformes	Annual therophytes (Th)	Biannual therophytes (TH)	Helo hydato phytes (HH)	Hemi crypto phites (H)	Geo phytes (G)	Chame phytes (Ch)	Nano phanero phytes (N)	Mega phanero phytes (MM)	Mezo phanero phytes (M)	Total species
Nr specii	2	1	0	21	2	1	1	6	2	36
%	5,56	2,78	0	58,33	5,56	2,78	2,78	16,65	5,56	100

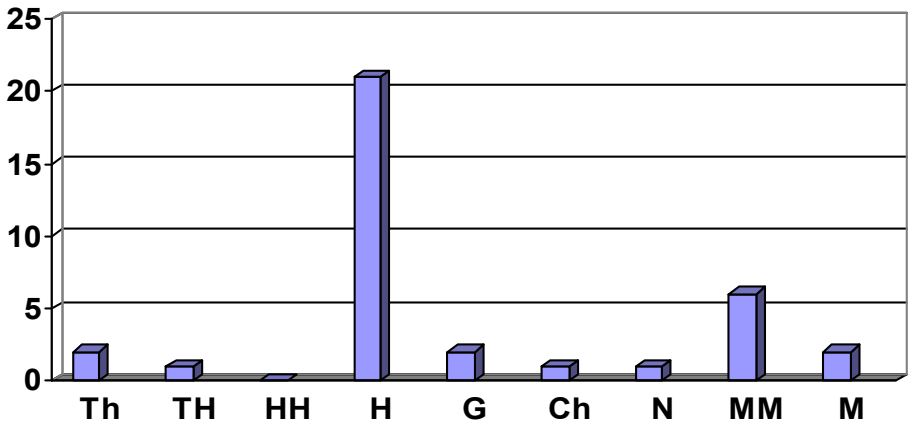

Figure 1. The spectrum of plant bioformes

Among the 18 plant families, the families of *Poaceae* (7 species) and *Asteraceae* (6 species) are dominant, followed by *Fabaceae* (4 species). The other plant families are lowly represented (1-2 species).

In the areas covered by 5-6 cm of soil rich in detritus, with a little coarse material, the colonization of biotope has been also made with species from the pastures around. The flora inventory showed species majority perennial. There was observed an increase of percentage of gramineous plants and a multiplication of the inter-specific relations.

The natural flora living on the surfaces exploited by mining activity has been totally destroyed. On these surfaces was largely installed a new type of vegetation, with different

structure than the initial, and ulterior, in time, pasture species specific to the researched zone were installed. Among these are: *Apera spica venti, Agrostis spp., Avena fatua, Festuca spp*. In the pastures with low fertility predominant is *Cyperus spp.* (papyrus sedges), and in the down and wet areas - *Juncus spp.* (rushes). In the pastures without rational grazing was noticed a high increase of ferns.

In the pastures with good fertility there was found perennial leguminoses, like: *Trifolium repens, Tripholium pretense,* different forms of *Lotus*, etc. In hayfields, the floristic composition is different, here predominant are the gramineous plats too, but also were found plants belonging to family *Asteraceae* (*Taraxacum officinale, Matricaria inodora, Anthemis arvensis, Centaurea cyanus, Primula officinalis, Cirsium arvense,* etc*.), Cruciferae (Capsela bursa pastoris, Lepidium draba, Nasturtium palustre* etc.), *Papaveraceae* (*Papaver rhoeas*), *Ranunculaceae* (*Ranunculus sp.*).

Transformation of the dump in pasture for animal breeding could be a good solution as economically aspect, and a reason to re-cultivate the degraded land. However, it is required the constant intervention of human being by periodical fertilization and over-seeding with annual leguminoses plants like *Trifolium* and *Lotus* in order to improve the quality of the harvested fodder.

The vegetal carpet has a height by 25-30 cm with physiognomy of single-layered pasture, which still maintains weed species exceeding the general height of the pasture.

CONCLUSIONS

The researched perimeter (bauxite lens) represents small land surfaces near Rosia locality, Bihor County, Romania. The mining exploitation exerted a strong impact in the area both by extraction activities and apparition of the bauxite lens.

The ecological succession follows the general line described by Clements from pioneer phytocoenoses with annual species (r-strategic) to pasture phytocoenoses represented by species specific to the research area (k-strategic) which form climax ecosystems, therefore it is recommended to respect the principle which stipulate that dumps must be stabilized, to create conditions for restoration of the natural vegetation characteristic to the investigated area.

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