STUDY OF ECOPEDOLOGICAL CONDITIONS, AND OF VEGETATION ON SOILS DEGRADED BY MINING DOMAN

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Abstract: *One of the most aggressive forms of agricultural and forest degradation landsaftelor by mining that is out of the circuit vast territories temporarily or permanently. The sterile waste dumps, once under the influence of external natural modulating factors, tend to create hydro-geological systems with specific shapes and dynamics that evolve more or less rapidly due to their particular characteristics, influencing the odds of foresting activities. We should emphasize that the initial (construction) stability of the waste dumps is the most important factor in the rehabilitation process The study area is a restricted area of land around the village Doman Existing natural flora on surfaces that have been affected by mining activities was destroyed completely on these supafeţe was installed largely one nine vegetation but in a different from baseline. Research carried out on the sterile mining waste in Doman consisted of observations concerning the dynamics of natural successions on these deposits depending on their age. Succession follows the general route designed by Clements, i.e. from pioneer phytocoenoses of annual species (r-strategic) to woody phytocoenoses built up by species characteristic to the area (k-strategic) building up climax ecosystems.*

Key words: *dumps, vegetation*

INTRODUCTION

Following drilling activities, the soil cover disappears by excavation and deep mixed rocks emerge, consisting of clay, sand, dust and gravel of high diversity from the point of view of their physical and chemical properties, but biologically and micro-biologically dead.

In order to establish the features of the studied waste dumps, we sampled soil to be analysed in laboratory conditions with specific methods. We then analysed the soil samples from the point of view of their pH, humus content, total nitrogen, phosphorus, and potassium.

As for the flora, it 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 as 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 with which we performed 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 through the agency of the wok, Flora României – *Flora of Romania*. Based on the data obtained on site and on the lists of species in the geo-botanic studies, we drafted the summary of the flora on the studied dumps.

For the physical, chemical, mineralogical, biological, micromorphological etc. characterization, we drew soil samples 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 DICUSSIONS

Ecopedological and vegetation studies were performed on the perimeter of the mining Ponor- Doman quarry, following up the following dumps:

- Domana dump elevation: 428 m, 430 m with a volume of 618 thousand m3 Occupied surface 3.10 ha. Dumped material: vegetal soil

- Domana dump elevation 352 m with a capacity of 114.8 thousand m3. Occupied surface 0.04 ha. Dump material: clay soil

- Dump elevation 420m, 427 m with a volume of 1170.2 thousand m3. Occupied surface 5.0 ha Dumped material: clay soil

- Dump elevation 342 m with a volume of 543.25 thousand m3. Occupied surface 4.3 ha. Dumped material: clay soil

The dumps were especially studied in their textural and agrochemical aspect, with the performance of determinations related to the reaction of the soil, the degree of provision with nitrogen, phosphor, potassium, content of humus and content of soluble salts. Based on such lab information, accompanied by the information on site, we drew the conclusion that such surfaces consists of a non-homogenous mixture of vegetal soil, sand, gravel, clay and residues of coal, distributed non-homogenously in the body of the dump.

Various types of soil were identified:

- moderate slopes, mainly sunny and half-sunny exposure.
- lands consisting of plain surfaces of the dump upper parts
- partially stabilized taluses, resulted as a consequence of the fact that dumps were not embanked in steps, but all the material permanently deposited on the surface of the dump.
- dump taluses made from various materials as size, with the prevalence of small ones, and with a ground consistency lower than 20%.

As a consequence of the study made on the physical and chemical features of the studied dumps, they found that their homogeneity degree is reduced which leads to a different establishment of species. It constitutes an argument for the technology to use a soil layer on the dumps.

Regarding texture, they noticed large differences, the dumped material has a very varied texture which shows that the mixture was weak or at all homogenized, on the depth of 50 -100 cm, it contains gravel and pebbles with varied dimensions, with a diameter smaller than 25-30 cm mixed with ground. As a consequence of the analysis, we found that the mean values of the content of clay from dump and from soils are very different.

The reaction of the dumps is weakly alkaline pH being of 7.15 on the talus of the Doman dump and 7.40 on the highlands.

The content of phosphates accessible to plants, expressed in ppm varied from 6.9 to 7.6 ppm. The degree of provision with phosphor was highly of the points taken very weakly and weakly into account. The content of assimilable potassium is weak, from 100 to 113 ppm.

As a consequence of the vegetation study performed along the research period we identified on the dumps a number of 76 species, 68 types and 27 families.

As a consequence of the performed researches we found that the flora is represented by 76 species, 68 types and 27 families.

We noticed an extremely heterogeneous structure of the species, the largest diversity of species being on the young dumps. The most frequent species on the studied dumps are: *Tussilago farfara L, Eupatorium cannabinum L, Salix caprea L Achillea millefolium L, Calamagostris epigejos Agrostis capillaris L, Rumex acetosa L, Rubus vulgaris Weihe et Nees, Poa pratensis L, Daucus carota L* etc. On such dumps, one can predominantly find species with low life pretentions, extremely rustic plants but meanwhile, and pioneer plants as well. They manage to quickly adapt to the dumps.

In some depression areas, resulted as a consequence of non-uniform, chaotic dumping, there appear swampy species, that is, species living under excessive moisture conditions like: *Carex vulpina, Juncus inflexus* etc. The clogging with time of such areas led to the extinction of swampy species, which were replaced by mesophilic ruderal species (*Cirsium arvense, Daucus carota*) or pioneer species, like *Tussilago farfara*.

The Asteraceae family is the best represented by 21 species, followed by Poaceae 11 species, Fabaceae 7 species and Rosaceae 6 species. The other families are represented by 1-4 species.

The analysis of the flora per categories of bioforms marks out the hemicriptofit species (H), represented in percentage of 50% of, *Achillea millefolium L, Centaurea rocheliana, Juncus conglomeratus L, Calamagrostis epigejos L., Poa pratensis L., Plantago major L.* etc

The following group is represented by annual terophytes (Th), which participate in proportion of 15.79 % of the total of the vegetation represented by species like: *Thlaspi perfoliatum L., Stachys annua L., Erigeron canadensis, Stanchys annua* etc. The other bioforms are weakly represented (Table 1., fig. 1.).

On Domana dump, Eurasian species (Eua = 57.89%) are the most representative followed by Europe-Central species (Euc = 9.21), European (Eur = 7.89%), circadian (Circ = 7.89%). The other categories are very weakly represented. (table 2).

Table 1

The statistic of bioforms on Doman dump

Bioforme	Th	TH	HH	H	G	Ch	N	MM	M	Total specii
Nr specii	12	7	-	38	5	1	3	5	5	76
%	15,79	9,21	0	50	6,58	1,31	3,95	6,58	6,58	100

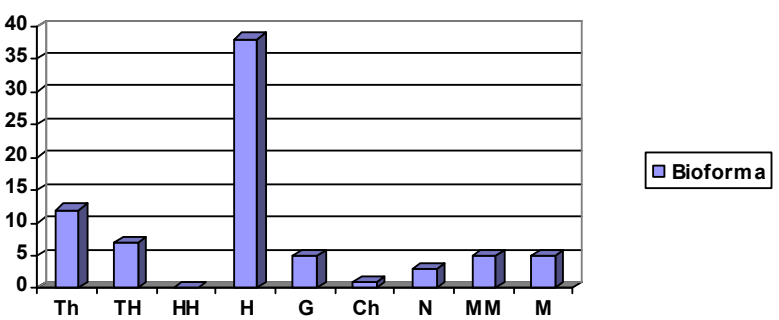

Figure 1. The spectrum of biomorf for flora on Doman dump

Table 2

The statistics of the floristic element son Doman dump

Elemente	Eua	Euc	Adv	Circ	Med	Cosm	Eur	Pont	Balc-Pont-Cauc	Carp-Balc-Anat-Cauc	Total specii
Nr specii	44	7	1	6	3	4	6	3	1	1	76
%	57.89	9.21	1.32	7.89	3.95	5.26	7.89	3.95	1.32	1.32	100

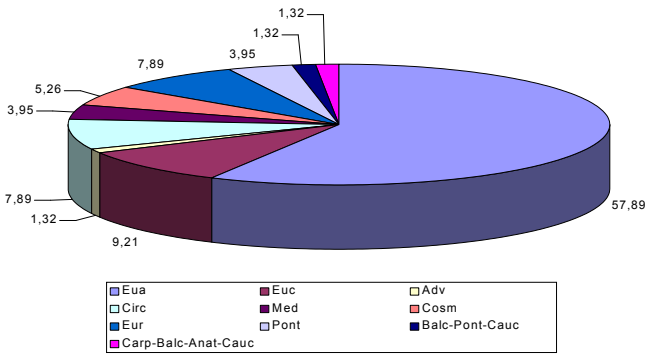

Figure 2. The spectrum of floristic elements for flora on Doman dump

Table 3

The balance of the ecologic categories

Indici	U		T		R	
Valoarea	Nr specii	%	Nr specii	%	Nr specii	%
0	6	7.89	19	25.00	39	51.32
01-1,5	7	9.21	0	0.00	0	0.00
2-2,5	27	35.53	3	3.95	2	2.63
3-3,5	31	40.79	44	57.89	9	11.84
04-4,5	4	5.26	9	11.84	25	32.89
5-5,5	1	1.32	1	1.32	1	1.32
6	0	0.00	0	0.00	0	0.00
Total sp.	76	100	76	100	76	100

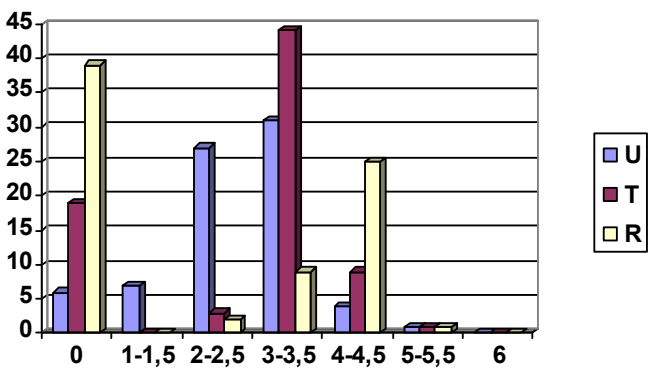

Fig 3. The spectrum of ecological index

The weight of ecological categories on Doman a dump is the following (table 3.,fig. 3):

- depending on moisture, the main species are mesophilic by 50.94%, followed by xero-mesophilic 26.42%, mezo-hygrophilic 9.43%, xerophilic 7,55, and euryhidric 5.66%. This

dump lacks in hygrophilic and hydrophilic species.

- depending on temperature, the main species are mesothermal by 58.49%, followed by eurythermal species 24,53%, moderate thermophilic 9,43 % and microthermal 7.55%.
- depending on the soil reaction, the main species are euriionice by 50.94%, followed by weak acid-neutrophil species 32,08%, acid-neutrophil 11.32%, 3.77% neutro-basophilic and acidophilic 1.89%.

CONCLUSIONS

Based on the observations, one can establish the main sequences of ecological succession.

The heterogeneous phytocenoses of annual and perennial weed are established on fresh dumps and on the occasional deposits resulted from dump unloading on the edge of the road to the main deposit. The characteristic biotope of such phytocenoses is represented by gross material, of marls with small quantities of soil or material with reduced size, like gravel in the meadows of rivers with low but almost continuous layer of soil. In both cases, the biotopes are flat.

The phytocenoses established in this biotope are edified by a high number of colonizing species, able to vegetate on a sublayer poor in organic substances. Amongst them: *Tussilago farfara* which makes main synusias of spring and is recognized as species characteristic for slope moderating. *Carduus acanthoides* is dominant in the weeds during summer, together with *Verbascum thapsus* and *Eupatoria cannabinum*.

The presence of some dumps of meadow perennial species like *Agrostis temiis, Medicago lupulina, Taraxacum officinalis Plantago major, Achillea milefolium* indicates the evolutionary tendency towards mesoxerophilic associations of *Agrostis tenuis* and the presence of the species *Clematis vitalba* suggests the possibility of passing directly or through meadows towards forest vegetation.

They identified phytocenoses of *Salix alba + Acer pseudoplatanus* with *Acer pseudoplatanus, Salix caprea, Betula verucosa*, they all representing the climax of the studied region.

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