RESULTS REGARDING SETTING OF VEGETATION ON THE STERILE DUMP AREAS FROM THE ANINA AND DOMAN MINES, CARAS-SEVERIN COUNTY

REZULTATE PRIVIND INSTALAREA VEGETATIEI PE HALDELE DE STERIL DE LA MINELE ANINA SI DOMAN, JUDETUL CARAS SEVERIN

IOAN GAICA, IACOB BORZA

Agricultural and Veterinary University of the Banat, Timişoara, Romania

Abstract: *This work shows up the results of an examination regarding the growth of herbal and ligneous vegetation on the sterile dump areas from the Anina and Doman coal mines, Caras-Severin County. Ecological reconstruction of depreciated soils as a result of mining activities by storing the sterile debris on the nearby fields.*

Rezumat: *Lucrarea prezintă rezultatele studiului privind instalarea vegetaţiei ierboase şi lemnoase pe haldele de steril de carbune de la exploataţiile miniere Anina şi Doman din judeţul Caraş Severin. Reconstrucţia ecologică a terenurilor degradate prin activităţi miniere de extragere a cărbunilor în galerii cu depunere a materialului steril pe terenuri limitrofee.*

Key words*: *ecological reconstruction, natural succession, sterile dumps, herbal and ligneous vegetation
Cuvinte cheie*: *reconstructie ecologica, succesiune naturala, halda de steril de carbune, vegetatie ierboasa si lemnoasa

INTRODUCTION

Mining do produce important changing to the lithosphere, atmosphere, pedosphere and biosphere, this changes depend on the exploitation type, the nature of the winning material and of the storing manner.

Mining produce great quantities of sterile dumps, they have different characteristics to the initial frame such as: accentuated scratchiness of the deposits that create the sterile dumps, the different retaining capacity of the water, the the grat variety of the microrelief.

The object of this research is the study of the activity area and vegetation growth on the depreciated lands from the affected areas by diggings and storing the excavated materials or burnings of the bituminous rocks as well as the coverings with warps brought by waters from those deposits, the growth of vegetation with the purpose of stopping the land degradation and pregressive improvement of those under the direct effect of some herbous and forest protection growings. On the affected lands as a result of mining there can be seen a restauration of naturat ecosistems as on the basic natural succession. The colonisation is made by pioneering species

MATERIALS AND METHOD

There were made observations on deteriorated lands by depositing materials which differentiate themselves by the slope microstationality, or phisical characteristics of the depositated materials on degradated lands by surface or depth erosions, warping transported by streams from the sterile debries. There were marked down known species and for each one the participation index on the vegetal structure eligible to the central european fitosocial methodology (BORZA AND BOSCAIU, 1965). The marked indexes are : ampleness, dominance and frequency.

RESULTS AND DISCUSSION

The treatment of luvosoil with four different doses of industrial waste showed important changes regarding soil fertility.

The observation that were carried out on the sterile dumps have on their structure : marne, marno-calcar, sicious calcar, silicious hones, variated dimension fragments (0-40 cm).
The values of monthly mean temperatures are between 0,5°C (January) and 22°C (August). The absolute maximums were between 39°C and the minimums -28°C (registered temperatures to the meteorological station in Resita at 226 m altitude).

Vegetation periods (mean daily temperatures >10°C) begins in the area around 5th of May and finishes on the second decade of October. The mean temperature on this period range between 11,9 to 13,1°C. Annually rainfalls are 704 mm/year.

For the examined sterile dumps there were identified superior grass species, mostly hemicriptophites and terophites with mezophile and mezoxerophite characteristics.

The basic phitocenosis with Tussilago farfara grow on the slope with an angle of 10-50° and even more scarce on the recent deposits. The vegetal structure is probative in most cases by the Tussilago farfara and rarely in a co-dominancy with Cardus acanthoides or Eupatorium cannabium. The floristical structure is different with the representative species and by different individuals.

Among the less affluent but relatively frequent species there can be stated : Agrotis capillaris, Holcus lanatus, Dactylis glomerata, Achille milleflorum, Clemantis vitalba, important for their capacity to form important populations in the subsequent steps of succession. Soil covering degree is of 40 to 100°. The interspecific relations are simple, profoundly influenced by dominancy.

Pioneer phito-cenosis of this type are described in the central European phito-sociological literature belonging to the Poo-Tussilagetum Farfare on the sides eroded by the land slip, warp deposits reach in organic materials.

This phito-cenosis can be maintained for more than 10 years, participating to the forming of the soil having an important role in the antiterosional preotection. The sporadic presence of Clematis vitalba, Fraxinus ornus, Salix capraea and multiple observation of phito-cenology indicats an evolution towards the specific forestry associations of the area.

The phito-cenosiswith Agrotis capilaris are present on the sterile dumps since less than 5-6 years on hte repopulation structurewith 5-10 cm with a rich soil in debris with few thick matherial.

This phitocenosis is the result of biotop colonisation by Agrostis capillaris and other steppe species placed in the nearby areas. Among the underlined species there can be met : *Dactylis glomerata, Plantago lanceolata, Erigeron annuus, Trifolium repens, Daucus carota, Tussilago farfara.*

In the first phasis ot the colonisation Agrostis capillaris is the main plant of the population that covers the soil in a percentage of 10-20%. In the next 4-5 years Festuca rupicola can become the co-dominant specie. The phitocenosis evolution is point out with the help of the colonizing character of Agrostis capillaris (COLDEA 1972, COSTE 1977), for the unused agricol lands, on the rocky soils, in the western part of Romania.

The resulted photcenosis of the first phasis of colonisation are considered as sub-associations preceding the co-dominant structures of *Agrostis capillaris+Festuca rubra* or *Agrostis capillaris+Festuca rupicola*.

The phitocenosis of Clematis vitalba fill the slopes with various angle ranging from 30 to 60 degrees and scarcer on the horizontal plane.

The sub-strate is made of voluminous fragments that accumulates debris in micro-depressions and soil reduced quantities. Clementis vitalba can initiate the succetion

possitioning itself on a bare soil or to continue the re-location, on a gradual way, of Tussilagop farfara cenosis.

Table 1

The sintetic table with the cenosis of *Agrostis capillaris* identified on the coal mines steril dump from Anina (An) and Doman (Do) (COSTE I. et alt)

Locality	Do	Do	Do	Do	Do	Do	Do	Do	An	An
Number to relevee	1	2	3	4	5	6	7	8	9	10
Exposition	-	-	S	-	-	-	-	-	-	-
Inclination (^{0})	-	-	15	-	-	-	-	-	-	-
Surface relevee (m^2)	20	12	12	10	6	25	12	25	25	25
Covertness degree of soil (%)	45	70	75	70	80	90	80	80	80	80
Vegetal cover highness (cm)	40	50	50	45	50	40	60	450	30	30
Agrostis capialris L.	2.5	4.5	4.5	4.5	5.5	5.5	4.5	2.5	3.5	1.5
Festuca rupicola Heuffel									+	2.5
Poa pratensis L									+	+
Dactylis glomerata L			+	+.1	+.2	+	+	+.2		
Holcus lanatus L	+.3	+		+.2						
Poa compressa L									1.5	+.3
Trifolium repens L	+.2	+.3		+.2		+.4				
Trifolium pratense L				+		+			+	+.2
Lotus corniculatus L		+.2	+.2			+.4				
Medicago lupulina L									+.2	+.4
Thymus pulegioides L			+				+			
Plantago lanceolata L		+		+			+		1.4	+.2
Erigeron annuus L	+	+	+			+	+	+		
Cichorium intybus L.			+	+		+.1				
Centaurea pannonica Simonk.	+.1		+			+.2	+			
Cerastium fontanum Baumg									+.3	+.2
Euphorbia cyparissias L		+.2				+				
Centaurea bibersteinii DC									+.3	+.4
Fragaria vesca L		+.3								+.2
Tussilago farfara L	+.2	+.2	+.3	+	+.2		+			
Calamagrostis epigejos (L) Roth				+					+	+
Daucus carota L				+	+	+.3	+		+.3	+.2
Linaria vulgaris Mill	+	+.3	+							+
Conyza canadensis L	+.3	+		+						
Eupatorium cannabinum L	+				+				+2	
Artemisia absinthium L									+.1	+
Leontodon autumnalis L	+		+		+		+			
Melilotus alba Medik.			+				+			
Carthamus lanatus L									+	+.2
Hypericum perforatum L	+	+					+			
Picris hieracioides L	+.1								+.1	
Plantago major L			+	+						
Rumex acetosella L									+	+
Verbena officinalis L		+		+						
Betula pendula Roth								+		
Fraxinus ornus L								+.1		
Salix caprea L								+		
Salix alba L			+							
Tilia platyphyllos Scop								+		
Robinia pseudacacia L								4.5		
Rubus vulgaris Weihe&Nees								+		

On the herbous pattern, in adition to the colonising species, can also be found *Salix capreae, Fraxinus ornus, Robinia pseudacacia, Calamagrostis epigeios, Veronica chamaedrys,*

Brachypodium silvaticum. Their presence indicates an evolution towards the mesophile woody associtions.

On the Ponor sterile dump, with a 50% covering porcentage, the size of the rock of 20 to 40, and an artificial soil frame of 50% there could be seen the following species: *Vulpina myuros, Dactylis glomerata, Calamagrostis epigee, Setaria pumilla, Agrostis capilaris, Verbascum sp, Arthemisia absiuthium, Erigeron annus, Heracium pilosela, Linaria vulgaris, Origonum vulgaris, Centaurea microanthos, Carlina vulgaris, Eupatorium canabinum, Portulaca oleracea, Poligonum persicaria, Amaranthus retroflexus, Sambucus embulus.*

On the plan area of 36 square meters with a 90% covering, a frame of 5-10%, and 5-10 cm soil, we identified the following species: *Calamagrostis epigeios, Vulpia myuros, Festuca rupicola, Agrostis capilaris, Daucus carota, Centaurea mycrantos, Rosa canina, Plantago lanceolata, Leontodon autumnalis, Euphrosia rostkoviana, Verbascum sp., Pinus nigra, Pirus piroster, Erigeron annuus, Tymus sp., Chrisantemum vulgare, Hieracium pilosella, Echium vulgare, Clinopodium vulgare, Holcus lanatus Betula verucosa Salix caprea, Populus sp., Achilea milefolium, Anthemis tinctoria.*

CONCLUSIONS

The re-covering of a sterile dump is a complex process when the herbous and/or ligneous vegetation re-establish itself on a surface with a reduced, natural fertility, more or less fit for growth and development of plants for the environment protection, the solidifying of the soil, and economical use.

The main colonising species are: Tussilago farfara, Agrostis capillaries, Salix capraea, Fraxinus ornus, Clematis vitalba.

The phitocenosis found on the coal sterile dumps and their dynamics towards the forestry vegetation is a pattern just like the one described in the phito-sociological literature concerning the agricultural deserted lands and slopes.

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