



RESEARCHES CONCERNING THE MINE WASTE DUMPS' AFFORESTATION IN THE FOREST AREA FROM BANAT

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ABSTRACT

The geological and hydro technical works, in the forest areas, generally produce the mine waste dumps. The paper presents the researches concerning afforestation process on a such mine waste dump situated in Forest District Caransebes, from Caras-Severin County. The aim of the research has been the study of the remaining level of black pine (Pinus nigra) planted on different site of the dump.

The preliminary conclusions, considering the remaining percentages one year after plantation, was presented for the dump's plateau , when the small sized saplings(5 mm,22 cm) of black pine (Pinus nigra) are recommended and on the dump's cutting slopes, when a mixed composition for afforestation, with black pine and with a shrub (Tamarix ramossisima) , is necessary.

Keywords : Mine waste dump, afforestation, black pine, Tamarix ramossisima

1. INTRODUCTION

The degradation lands' process and how can these lands be reinserted in the productive cycle, is nowadays a general and acute problem. Especially the small residual materials, which have been accumulated in the mine waste dumps, represent an unwelcome situation because, in a way, these dumps cover the agricultural and forester productive lands and, in the other way, they are very instable and can spread out the dust and the other small particles over the neighboring lands. More dangerous in this category are the industrial ashes or mineral flotation dumps, with fine particles that can be easy spread by the wind, over a large area, covering the towns, villages, orchards, meadows etc. These industrial dumps are also very unstable and can easily move down, into the rivers valley or into the lakes when are taken away by the water, forming the sediments or dams on water streams.

These mine waste dumps are often formed in the proximity of human settlements and industrial objectives. Then, they will generate a permanent source of dust in houses, industrial halls, offices, mainly in stormy days, not to mention the bed aspect of the landscape. The danger is greater when the waste dumps are formed by the toxic materials (sulfur and it compounds, chlorides etc.) who can spread around the dump by the action of wind and erosion. Therefore, the waste dumps are the

main cause of water pollution and the destruction of the fauna, along the river way, in the areas where they reside .

For all these reasons, the problem of waste dumps consolidation and afforestation represents a social necessity.

The waste dumps, like shown above, are also situated on the big unused lands who can have a productive utility. Covering them by useful vegetation is a good solution not only for dumps consolidation and for landscapes improvement, but also for good use of empty lands.

The afforestation of the forest lands temporary covered by the mine waste dumps, not to mention the ecological and social reasons, represents an imperious necessity because these areas must turn back, by low, to their initial destination. There are many situations like this in all south-western counties of Romania. The most frequently and difficult cases are in Caras-Severin and Hunedoara Counties where, in the last decades, many of geological and hydro technical works have been executed.

A very different from one another, a general solution applicable to all of them does not exist. In most of the cases, research activities and experimentations, extended over a couple of years, are recommended in order to come up with the best technical solutions.

2. PLACE AND METHODS OF THE RESEARCHES

The researches, during almost two years, were carried out on a mine waste dump produced by the hydro technical works . These works was necessary for accumulate some secondary water sources from the basin area of Slatina river.

In the forest management project, this waste dump was described like an unproductive land that, in administrative meaning, forms the subplot N68, with 1.2 ha. (Amenajamentul UP IV Turnu Ruieni, OS Caransebes, 1996).

They can mention the following natural conditions , characteristic for this area:

- geological substratum, whit sericito -chloritoses schists ;
- hydrological net with permanent water (Slatina River):
- moderate continental climate, with Mediterranean's influences, the annual average temperature being 7°C and 800-1200 mm pluviometer annual regime .

The waste dump has a trunk of pyramida form, with two side longer than the other. It superior section, meaning the plateau, is a rectangle with 60/150m dimensions, border by the 40 - 45° proclivity slops that going down on the plateau to the river valley. The dump material is principally formed by the big stoniness fragment, over 2 cm in diameter.

Considering the dimensions, the compositions and the provenance of this waste dump, we can classify it into a follow category (Traci, 1985): the mine waste dump composed by acid and basic fragments of stone (heavy stones, boulders, gravels etc.) , deposited in hillocks and billows, 20-30m in height , with 40-45° stabile slops, located in the beech vegetation sub zone, that may included in *Hmcl* type of station .

ACH Caransebes is finished the transport and deposit of the waste material, on spring time of 2000 and has delivery the mine waste dump from the ancient owner, OSE Caransebes . At deliverance, the user has been obligated to spread a fertile soil stratum over the dump, mainly on the plateau, for a future successful afforestation

The research has started on March, 2001, and consist in :

- observation regarding the spontaneous install of vegetation on the waste dump ;
- to take the sample material over the dump, for the laboratory analyses ;
- to install some formula experiments of afforestation, using the forest an the other species, with adequate ecological characteristics.

The experiments use a single forest specie, black pine(Pi.n) - *Pinus nigra* and a shrub , red tamaris (Ct) – *Tamarix ramossisima* . These two species are indicated on the bad soil conditions because its ecological characteristics assure the permanence and a normal development on these sites (Donita, 1977).

Two samplings plots of black pine are been installed, both on the plateau and on the slopes. The plots count 300 saplings black pine each . Every of these plots contain the six groups of 50 sapling, representing six categories of stem collar diameter size, as follow : I – 3mm ; II - 4mm ; III - 5mm ; IV – 6mm ; V – 7mm ; VI - 8 mm .

The plantation has done on March 10-15 , 2002 , using the individual sapling pits, in a plantation scheme with 5000 saplings/ha. The initial dimensions of the samplings have recorded and, after a years (on spring ,2003), the percentage of the remaining saplings has evaluated by the groups of size that have mentioned up there .

3. RESULTS AND DISSCUTIONS

The results of the soil laboratory analyses , by tree deep levels, are shown into the table 1 :

Table 1

The physical and chemical characteristics of the superficial strata over the mine waste dump

Soil profile	Deep level (cm)	Humidity %	Ph	Humus %	Carbonates %	Total nitrogen %
Ao	0 -10	0.813	8.170	1.442	0,973	0.074
	11-20	1.373	8.540	0.817	10.058	0.042
	21-30	0.950	8.790	0.096	8.347	0.005

Analyzing the table's data to the surface strata from the deep, they can observe that the humus and nitrogen content present a progressive diminish but, in the same time, the level of the other analyzed elements (humidity, pH, carbonates) is growing .The soil reaction (pH) is alkaline (8.170-8.790) .

Before plantation , they could observe that the spontaneous forest vegetations , like *Populus tremula* and *Salix caprea* species , are already installed on the surface. The thinning out of these species was heterogeneous on the small sites over the dump, forming the groups, bouquets and clusters. The spreading on the plateau (30% of surface , in a groups and clusters) and on the slopes (5 % , just isolated plants or a small bouquets of them) was very different. The similar situation were also observed on the mine waste dumps from Forest District Rusca Montana (Frățilă, 1994).

The black pine saplings evolutions, separately on the plateau and on the slopes, were analyzed .

Table 2
Black pine (*Pinus nigra*) saplings evolutions , on the plateau

Saplings characteristics (2002)			2003 inventory	
Collar diameter (mm)	Height average (cm)	Number	Number	Remaining percentage
3	16.30	50	42	84.0%
4	19.56	50	40	80.0%
5	22.43	50	44	88.0%
6	25.36	50	32	64.0%
7	28.42	50	45	90.0%
8	32.34	50	38	76.0%
Statistics	Total	300	241	
	Average	24.07	40.17	80.3%
	St.dev.	5.87	4.75	9.5%
	S%	24.4%	11.8%	11.8%

The data from the table 2 show that the remaining percent of saplings was over 80%, on the plateau. The highest remaining percent was observed at medium dimensions saplings , with collar diameter (Dc) - 7mm and height (H) over 28 cm. The over average results (88%) were also recorded at the small dimensions saplings. (Dc – 5mm and H - 22 cm) .

Table 3
Black pine (*Pinus nigra*) plantation data , on the slopes

Plantings characteristics (2002)			2003 inventory	
Collar diameter (mm)	Height average (cm)	Number	Number	Remaining percentage
3	16.34	50	14	28.0%
4	18.78	50	24	48.0%
5	22.42	50	28	56.0%
6	24.87	50	24	48.0%
7	28.21	50	16	32.0%
8	33.21	50	14	28.0%
Statistics	Total	300	120	
	Average	23.97	20.00	40.0%
	St.dev.	6.19	6.07	12.1%
	S%	25.8%	30.3%	30.3%

Using the up table's data, for the plantation were effectuated on the slopes, remaining percent average was calculated a very small (40 %). The best result was recorded at the small dimensions of the samplings (Dc-5mm and H – 22 cm), with a 56 % remaining percent average .

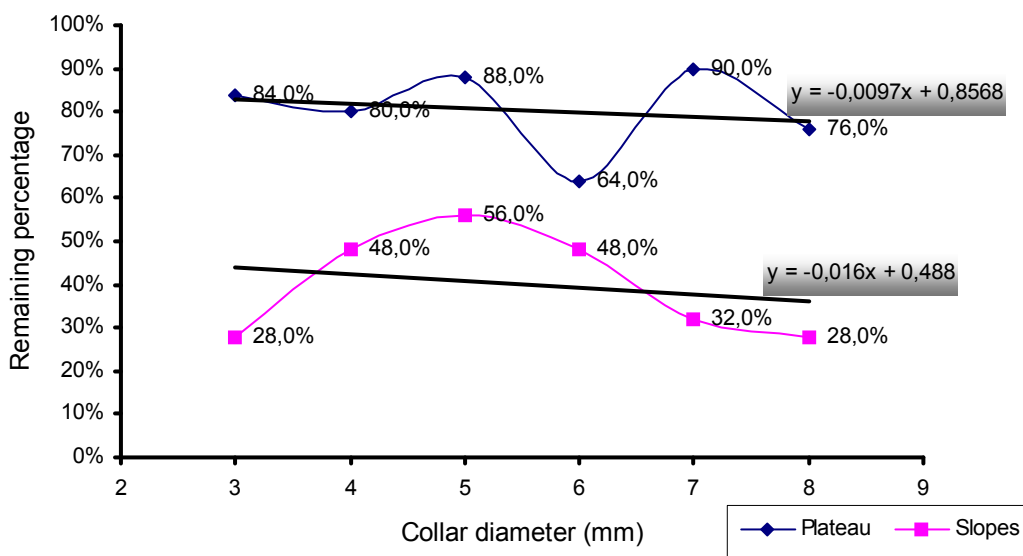


Figure 1 . Variation of remaining percentage with collar diameter , for the black pine , one year after plantation

There was, on the graphics, a comparative analyze of the remaining percentage variation, by collar saplings' diameter. They can observe that, on the plateau site, the variations of the remaining percentage are, generally, smaller (s% - 11.8 %) . The curve has a complex evolutions, reaching two peaks at the small and medium size category of the saplings (Dc – 5 mm and 7 mm). On the slope sites, the variations of the remaining percentage are generally higher (s% -30.3 %), The curve reach just a single peak, at Dc – 5 mm saplings size.

In both of these situations, seeing the tendency lines, they can appreciate that, over some certain dimensional size (Dc – 5 mm and H – 22 cm) of the saplings, the remaining percentage has a lower tendency. In conclusion, using the bigger dimensional saplings than these, is not indicated .

After the comparative data was presented up there, the black pine saplings more indicated are a small sized ones (Dc – 5 mm and H – 22 cm), both on the plateau and on the slopes.

The saplings with bigger size are also had a good remaining percentage, but only on the plateau sites . Therefore, for a complete afforestation on the plateau sites, over the mine waste dumps is sufficient to use a single forest specie with different dimensions samplings size. The situation is different on the slopes because the remaining percentage after plantation, for a main forest specie like black pine, is not enough . This specie can not assure, by itself , the covering and the stabilization of a mine waste dump's slopes. For that, the experimental plantations plots with a two species planted composition, was realized. A shrub, *Tamaris ramossisima*, were experimentally used , in 40 % mixture with black pine.

4 . CONCLUSIONS

As a result of these researches, the following preliminary conclusions can be formulated :

- the mine waste dumps, after the geological and hydro technical works , are generally formed by materials with very alkaline pH and high content of carbonates;
- for over 1cm particles sizes, the natural stabilization of the slopes is at 40 – 45 ° proclivity;
- the spontaneous forest vegetations installed on the mine waste dump was *Populus tremula* and *Salix caprea* ;
- the small sized saplings of black pine (Dc – 5 mm, H – 22 cm) have done the best results on the plateau site, with the highest remaining percentage (over 88 %) one year after plantation;
- the remaining percentage of black pine, on the slope sites (lower than 40%) is insufficient for cover and stabilize the mine waste dump. In this case, the mixed planted composition, with 40% a shrub (*Tamaris ramossisima*) and 60% black pine is recommended.

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