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ECOLOGICAL RECONSTRUCTION IN THE BANAT BLACK PINE SITE FROM "DOMOGLED-VALEA CERNEI" NATIONAL PARK

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Abstract:
The ecological reconstruction, included in the project LIFE04NAT/RO/000225, came as a result of the fact that in 2000, a forest surface over 90 ha was destroyed by fire. Following field observations and evaluations, a perimeter of 25 ha was identified, on which forestry vegetation was severely damaged at levels of trees, underbrush, shrub and seedlings. In this area it was considered necessary an ecological reconstruction through plantation of Banat black pine. The works was done between 2003 – 2007 and have included following actions: the analyse of the stationary and vegetation conditions, collecting the black pine seeds, producing seedlings with protected roots, land release and clearing and digging the hearths for plantation . Some succes evaluations of this ecological reconstruction were made in the summer and fall of the year 2007 and 2008. The averages of the survival percent were 79,56%, in 2007 and 74,80% in 2008.
Key words:
Banat black pine, producing seedlings, planting in hearths

1.INTRODUCTION

During time, karsts areas with hilly landforms were frequently affected by phenomena of destructive nature, such as fires or flooding, which lead to the disappearance of forestry and shrub vegetation on certain area. Reintroducing forestry vegetation in these areas has always been a problem, because through excessive erosion, an obvious antagonism was created between climatic and soil factors, exercised through the plants reduced possibilities, due to the humidity soil deficit, to maximum use the solar heat and light [5]

Regarding to the calcareous cliffs pine forests from Cerna Valley, information exist that they were affected by the catastrophic floods from 1910. At the time, the Austrian forestry regime attempted to teforests the surfaces with black locus and black pine, but with poor results [3].

Reforestation difficulties of such degraded field required a necessary scientific analyze of how the plantation can be realized, under the aspects of species composition and plantation technique. In this directions, several studies tested the reintroduction of black pines in areas of calcareous cliffs [2,3,5,6]

From methodological point of view these studies analyzed:

- The way in which already existent black pine forests installed and developed in this area;
- Stationary characteristics from point of experiment (geomorphology, climate, soil physical and chemical characteristics, soil erosion etc.);
- Black pine sapling development in different experimental variants of plantation (sapling pricked from different nurseries, direct plantation in hearths, plantation in saplings grown in bags of polyethylene);

2. ECOLOGICAL RECONSTRUCTION IN THE BANAT BLACK PINE SITE

The Banat black pine (*Pinus nigra* ssp. *banatica)* is an endemic subspecies with a restricted area in the south-west of Romania. It constitues today representative forest ecosystems on the western slopes of Mehedinti Mountains, at altitudes between 500 and 1200 m, alongside the thermal rupture Baile Herculane and on the calcareous Domogled plateau. The Banat black pine ecosystems represent a prioritary europeean habitat: 9530*" Sub-Mediterranean pine forest with endemic black pine ", included in the ROSCI0069 site, from "NATURA 2000" network , which overlaps on the territory of "Domogled-Valea Cernei" National Park.

This action, included in the project LIFE04NAT/RO/000225, came as a result of the fact that in 2000, a surface of over 90 ha, from the U.P. (Production Unit) IV Domogled was destroyed by fire. The forest lasted approximatively 20 days and affected the forestry vegetation of Banat black pine and mixtures whit different deciduous species. The burned forestry parcels were 108, 109, 112, 113, 116. Following field observations and evaluations a perimeter of 25 ha from u.a. (forestry parcel inside of production unit) 108B was identified, on which forestry vegetation was severly damaged at levels of trees, underbrush shrub and seedlings. In this area it was considered necessary an ecological reconstruction through plantation of Banat black pine. On the rest of the surface, it has been appreciated that plantation isn't possible, because in some cases the soil totally lacks from cliff, and isn't necessary where the fires produced partial damages, and forestry vegetation can regenerate in a natural manner [1, 4]

Ecological reconstruction in the project considered the previous experience of black pine plantation from calcareous cliff in Banat, both from the methodological and practical point of view, and the results of the researches in the field. Thus, before the ecological reconstruction:

- was made and analyze of the stationary and vegetation conditions in the established perimeter;
- the black pine seeds collecting was assured from seeds reservations found near the ecological reconstruction area;
- sowing material with protected roots was produced;
- a plantation scheme adequate to the hilly field conditions was established ;
- an evaluation of the success percentage was made one year after the plantation.

2.1. Stationary and vegetation conditions

The soil type that characterizes u.a. 108 B is rendsine. The horizons profile successions is Am-A/R-Rrz.

Regarding the forestry evolution older management studies proof that species proportion, in this u.a., were 50% beech, 10% Banat black pine, 10% mountain maple, 10% manna, 20% diverse strong essences. Today, the beech proportion has reduced whit about 10% in favor of the Banat black pine, species that evolved through natural regenerations and by completion whit saplings of local provenance.

The most important elements regarding the stationary and vegetation conditions are classified and described in the types of stations and forest (Table 1)

Table 1- Stationary and forest types in u.a. 108B

No.	Stationary type	Forest type	
		Code	Name
1.	Mountain/premountain beech forests, Bi, cliffs.	3.2.1.3.	Black pine mixture with deciduous, on limestone (i)
2.	Mountain/premountain beech forests, Bi, rendsines, little soils	2.3.2.2.	Mixted mountain beech forests

In the ecological reconstruction perimeter surface erosion is generalized, process emphases after the fire by the disappearance of shrubs and grass. In the future these phenomena can accentuate, leading to land slides, debris and cliffs rubbing, justifying the ecological reconstruction. The following compensatory factors need to be considered for the success of the works:

- the altitudinal decrease of temperatures and reductions of the vegetation season are compensated by an increase of the solar radiation intensity;
- the reduced organic capacity of some soils can be compensated by extra humidity and a large useful soil volume;
- soil of sunny versants are droughty, instead the microbiological activity is more intense;
- shaded expositions have a shorter vegetation seasons, and the danger of early and late frosts is smaller;
- limestone presence reduced the adverse influence of altitudinal growth on the lenth on the vegetation season.

2.2. Works for land release and clearing

Following the 2000 year fires, trees from the ecologically reconstruction area were partially affected, through barks burns, in some case entirely, leading to the destruction of a large volume of trees. The land occupied by these trees was submitted to clearing works, consisting on feelings, clearing, fashioning and gathering the foot-dry wood material in parcel 108B, that had to be reforested. The wood material had to be cut and evacuated from this perimeter was almost 1740 m^3, corresponding to a number or 2100 trees. The wood material generated from the clearing works, was cut down and rough converted in ster wood, gathered with arms and deposited in stockpiles on knags.

2.3. Producing implantation material

According to the stationary conditions a planting plan of 1x2m was established, requiring the introduction of 5000 black pine sapling/ha. Therefore, to the 25 ha integral plantation a number of over 125000 black pine sapling was utilized, and in the next 2 years, for the completions, that in principle will represent about 12 ha, another 60000 more saplings shall be required.

Starting from these necessities, since the fall of 2003 were applied measures for obtaining this implantation material. This process consisted of: harvesting Banat black pine seeds from the nearest forest to the plantation area, showing in solariums and pricking out saplings from nurseries.

The black pine seeds harvesting was made in fall 2003 from the seed reservation PI.N-F232-1, situated in UP VI, u.a. 89, Băile Herculane Forestry Unit. In the spring of 2004, these seeds were showed in the Brăduț nursery solarium, from the Bozovici Forestry Unit on a nutritive bed formed from 60% beech humus, 20% spruce humus and 20% sand. The showing was made manual, on gutters, the distance between them being 5 cm. The wetting of the germinative bed was done immediately after the sowing, and continued periodically, through aspersion, assuring the permanent moisture of the superior layer in which seed germinate. For the soil fertilization , 5 l/m² of ammonium nitrate, simple superphosphate and potassium salt, dissolute in water, were applied (Figure 1).

Figure 1. Banat black pine seeds sowing in the Brăduț nursery solarium

Weeds control in the solarium was done manually, through hand weeding. After the sapling were removed from the solarium, they were sorted, the healthy and vigorous ones, well raised, and with a rich radicular system were considered fit for pricking and temporary deposited at ditch. In the spring of the year 2005 the pricking of 126900 sapling, in polyethylene bag of 12 cm diameter and 25 cm length, were made [6]. These sapling with protected roots were disposed on layers, and the holes between bags were filed with dirt, they being directly used in plantation in the years 2006 and 2007 (Figure 2).

Figure 2. Saplings layer disposal- Brăduț-Bozovici nursery

In order to produce the saplings required for completions in the next two years, the block station nursery ”Domogled” was also established, in which saplings were pricked out in layers, without root protection. In this case we can observe a good development of saplings, explained by the fact that the block station nursery, being situated near the seeds harvesting place, benefitted from climatic and soil almost similar to the trees that supplied the seeds [1,2]. A number of 53800 saplings were produced here, and are still maintained in culture.

After pricking all the saplings, the cultures were maintained trough hand weeding the saplings layers, wetting the cultures with rain water, and their fertilization with chemicals.

In the fall of 2006, after a development period of about 2 years in open field, the bags contained saplings were transported from the Forestry Unit Bozovici in the plantation area Domogled. (figure 3).

Figure 3. Bags with saplings, transported to the plantation area Domogled

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2.4. Works for Planting

The effective preparation for plantation consisted of a partial land clearings from rocks and debris, arrangement of the plantation space and digging the hearths. The field's clearing from rocks and debris on about 30% of the surface, meaning 7,5 ha, and supposed the rocks removal from the soil and their storage in stacks and rows.

Figure 4. The removal of plastic bag

Following the plantation scheme of 1x2 m, the wooden scraps and litter were removed from 60x80 cm surfaces in the centre of with hearths of 30x30x30 cm were digged, corresponding to the earth bowl from the bag. The plantation was made after the removal of the plastic bag that protected the roots.(Figure 4).

After introducing the bowl and the roots in the special prepared hearth, followed the compression, by foot, of the soil surrounding the sapling to ensure a good contact between the roots with the nutritive environment (Figure 5).

Figure 5. Earth compressions after plantation, in order to assure a good contact of the pine radicular system with the nutritive emvironment

It can, also, be observed on the graph that in 10 surfaces, the survival percents are higher than 80%. On the field, this area has been identified at the base of the versant. On the other side, in 4 plots situated in the superior parts of the versant, survival percents are under 65%.

Al these data, in characteristic conditions of climate and soil of the ecological reconstruction perimeter, represent a high quality work.

3. CONCLUSIONS

A first evaluation of the ecological reconstructions was made in the summer and fall of the year 2007, by determination of the plantation's success percent after one year, followed by a second similar evaluation, in 2008, after two years. Evaluating the success percent assumed the inventory, in 25 testing rectangular plots of 10/20 m, of the surviving saplings and their percent from the total saplings used. Each corners of these testing plots was materialized trough a wooden peg, for returning at inventories, in the same surfaces, until the definitive success of the plantation and closing the massive status.

The chart from figure 6 expresses the variations of the survival percent in different testing plots. Generally, it can observe that the survival percents in the first year (2007) were higher than in the second year (2008).

Calculating some statistical values, one year after plantation (2007) the average of the survival percent was 79,56%, with a variation coefficient (s%) among the testing plots of 6,8%. In the second year (2008) , the average of the survival percent was only 74,80%, with a variation coefficient (s%) among the testing plots, of 11,8%.

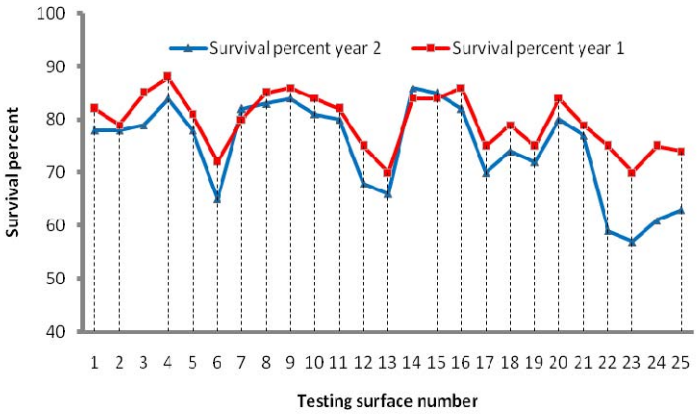

Figure 6 . Survival percent variation, one year (2007) after plantation and two year (2008) after plantation

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