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RESEARCHES ON ECOLOGICAL RECONSTRUCTION OF BOUNDARY FOREST IN PIETROSUL RODNEI MASSIVE

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Abstract

The present paper aims to evaluate the outcome and the progress of the ecological reconstruction works carried out in the old stand of the Pietrosul Rodnei massive by analyzing the variance for the main morphometrical characters of the installed seedlings. The afforestation composition was represented mainly by the Pinus cembra seedlings. In order to achieve the above mentioned target, one used the grid method to set up sample surfaces of 200 m^2, realized the inventory of seedlings for each sample area and carried out the following measurements: the overall height of the seedlings, their growth recorded during the 2012-2013 vegetation season and their stem base diameter. The results of the measurements were statistically processed by calculating the coefficients of variation for different characters, as well as correlations between elements, the regression equations and by calculating the coefficient of regression. After analyzing the registered data, one concluded that all elements present a high and very high variability of the characters, due to the genetic diversity of origins, therefore the future of the newly installed stand is ensured and a proper and successful selection of tree can be performed + improving all analyzed characters, highlighting the elites and increasing the value of the stand. Following the performed correlations, one noticed a direct and distinct significant link between the height of seedlings and their stem base diameter. The differences between the average growth of the two analyzed seasons are differentiated on sample groups of sample markets. After carrying out the research and analyzing the obtained results, one can conclude the success and the opportunity of restoring old stands, as well as the ecological reconstruction of the area studied.

Key words: *Ecological reconstruction, sample markets, seedlings, stand.*

INTRODUCTION

One of the most complex ecosystems on Earth with a huge impact on human life is the forest. The forest has been a resource of raw materials for humans; it provides wood used in various usages; it is a shelter and food provider. But the most important role of the forest is about that it influences all climatic factors. Erosion and degradation occurs at a much higher intensity than in other areas due to excessive frequency and aggressiveness of climatic factors correlated with high slopes and high energies of the relief. Knowing that the significant amounts of rainfall occur in these regions, the forest has the role to retain a large quantity of the water over the vegetation canopy and especially at ground level via the root system and different mosses living in symbiosis with trees and shrubs species and acting like a real " living sponge" absorbing an appreciable amount of water. (Savulescu, Negulescu, 1967)
Action factors that led to the degradation stands at the upper limit of vegetation can be evidenced by the negative consequences, materialized into: a) torrential phenomena; b) accelerated erosion; c) landslides; d) disappearance of some endemic plant species, e) regressing of natural range; f) decreasing of animal livestock; g) landscape degradation, h) increasing windfalls in the stands at the upper and middle slopes etc. (Taras George Seghedin, 1979.)
To remove these negative effects is needed restoration stands at the upper limit of vegetation. In this paper are presented the studies, which were conducted in Picioru Mosului (UP VI Pietrosu), where were observed the natural and artificial regeneration evolution of the best represented species in the

upper limit of the forest.(Amenajament UP VI Pietrosu,2008)
The objectives of the paper are: a) results and evolution of the ecological reconstruction assessment upon the boundary stand from the massive Pietrosul Rodnei by analyzing the variation of the main taxatoric characters of Swiss stone pine installed seedlings; b) the height increasing progress from the last two seasons (2012 and 2013); c) taxonomy elements variability assessment of seedlings; d) setting characteristics of Swiss stone pine seedlings specific of the studied area; e) correlations establish between seedling height and diameter at their root crow.

MATERIALS AND METHODS

To achieve the paper objectives, to have a relevant statistical coverage, were located a total of 10 samples, with circular form; each one with an area of 200 m^2, in total 8% of the studied area (Norme Tehnice ,2000); within each being assessed 15 Swiss stone pines (*Pinus cembra*) seedlings on which were determined the following elements: a) seedlings total height, measured from root crow to terminal-bud, b) the seedlings development from the last growing season; c) the seedlings development from two growing seasons; d) seedlings root crown diameter.
The values mentioned above from point a) to point c) were determined using a tape measure with a millimeter precision, and for the root crow diameter was used a caliper with a tenth of a millimeter accuracy.
The delimitation of sampling surfaces was taken with the help of a string. The average slope determined was about 30° and from The Technical Norms results a total string length of 8.57 m, with a corresponding 200 m^2 sampling surface.
The measurement results were statistically processed by calculating the variation coefficients of different characters, and also were made correlations between elements exposing their regression equations and the calculation of the regression coefficient. (Ardelean M., 2006.)

RESULTS AND DISCUSSIONS

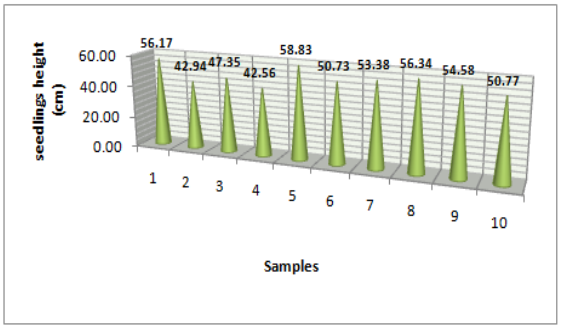

Figure 1. The differences between average heights of the seedlings

After analyzing figure 1, it could be observed that the highest values of seedlings height record for 5th, 1st and 8th samples, these being located in the middle area of the slope. The lowest values were registered for the 2nd, 3rd and 4th samples; these being located in the upper area of the slope. Showing this result it could be conclude that the orography influences the seedlings height.

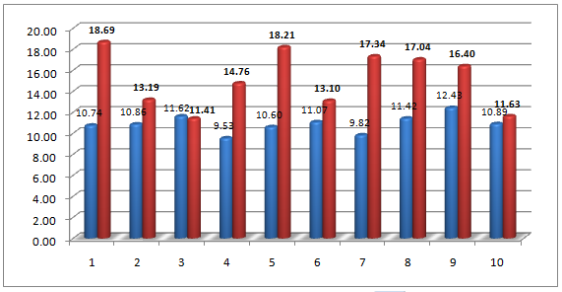

Figure 2. The seedlings growing the seedlings development from the last growing season; the seedlings development from two growing seasons

In the last growing season the highest values were determine for the seedling from 9th, 8th and 3rd samples, and the lowest values were for in the 4th sample (Figure 2). The growth from the last two growing seasons has the same trend, obviously because the placement inside the slope influences this character.
Also there is a growing difference between the two years; in 2012 the growing is significant highest then the growing from 2013, in all the samples, with exception of the 3rd sample. The differences between the two seasons is determined by climatic factors variations.

Table 1. Synthesis for coefficient of variation (CV%) for measured characters

CV %	Samples									
	1	2	3	4	5	6	7	8	9	10
	Total height (cm)									
CV %	173.99	506.58	670.03	312.07	385.01	251.63	295.72	421.04	247.53	470.69
	The seedlings development from the last growing season – 2013									
CV %	85.75	107.17	80.92	145.20	136.19	110.07	62.98	68.03	55.09	39.06
	The seedlings development from two growing seasons – 2012									
CV %	46.38	177.47	163.42	109.74	80.94	98.82	164.47	181.83	107.42	79.39
	Root crow diameter (mm)									
CV %	43.89	39.74	107.92	68.71	102.36	71.00	87.94	131.49	47.83	20.05

Legend: CV means coefficient of variation

Analyzing data showed in table 1, according with appreciation scale for variation coefficient described by (M. Ardeleanu 2006), it could be concluded:

- Regarding the seedlings total height , variation coefficient for each sample, has very high values (CV%>30);
- Regarding the growth from the last growing season, the variability is very high, the same with seedlings height;
- The highest value of variation coefficient of the growth from the last seasons is registered for 8th sample (CV%=181.83%), followed by 2nd and 7th sample; in all samples the coefficient being very high;
- Analyzing the values of variation coefficient regarding root crown diameter, it could be concluded that the variability of this character in the 10th sample is high (20%<CV%<30%), but this values being the smallest, followed by the 2nd sample with CV%>30%. In all other samples the variation coefficient has higher than 30% values, the character variability being high.

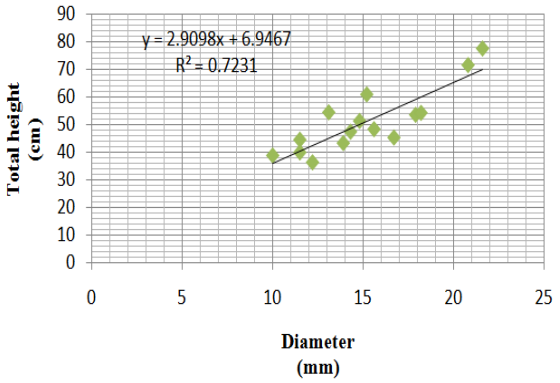

Figure 3. Correlation between height and root crown for 6th sample

Analyzing data showed in figure 3 it could be observed that between the two characters (seedlings total height and root crown diameter), after the comparison of "r" correlation coefficient values ($\sqrt{r^2} = 0.723$ – calculated obtained), with table values of "r" for transgression probabilities of 5% and 1%, for GL=14 (Ardelean, M. (2006) exists a directly and significant link. Analyzing the regression equation between those two characteristics ($y = 2.9098 * x + 6.9467$), it is establish that the seedlings from 6th sample, with a increasing of 1 mm at root crown, the height increase with 9.85 cm.

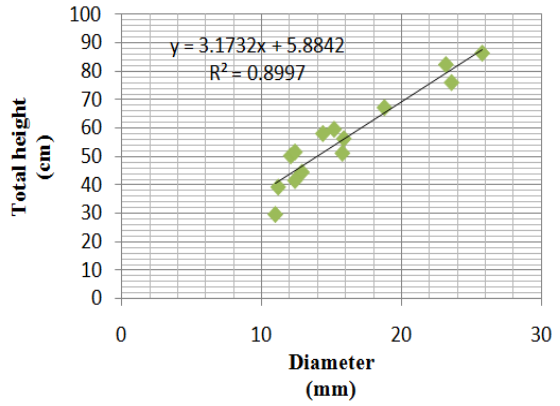

Figure 4. Correlation between height and root crown for 8th sample

Analyzing the value of "r" correlation coefficient (Figure 4), results that between average of seedlings height and root crown diameter exists a directly and distinct significant link. Also, between those two characters was established o linear simple regression, this one being exposed by regression equation $y = 3.1732x + 5.8842$.

Regarding with the regression equation, it could be established that for each millimeter of root crown diameter, the height of the seedlings increases with 9.05 cm.

CONCLUSIONS

1. The differences between the heights were significantly, influenced by the seedlings total height, as well as the zonal micro-relief. Thus, significant variations were observed at seedlings located in concaved and convex areas, which were generated by the stream and rock localized in the plantation.
2. The samples located in the upper area of the plantation, although this area has an extremely small edaphic volume plantation, the presence of the rocks making difficult the installation of woody vegetation, due to lack of competition from other species such as woody and herbaceous, Swiss stone pine vegetates very well in such conditions. Also placing seedlings in this area affected very well their development and the micro-relief influenced the height growing, observing a notable difference among these values.
3. Regarding the seedlings height, in all samples variability of this character was high and very high, hence the conclusion that the choice to promote elite in terms of this character, it is possible.
4. Also, the root crown diameter has a large and very high variability of this character, so it's successfully being able to make the choice to promote valuable items. Large variability of these elements has genetic determinism; the plantation was established with seedlings from several origins.
5. According with the correlations, it was found there in all samples is a direct link and distinct significant between seedling height and root crown diameter. The differences between the average growth of the two seasons are analyzed are differentiated on sample groups. After this research, it can be concluded the success and opportunity restoring old stands and reconstruction of the area studied.

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