Aspects regarding the correlation between the average density and the average height of the seedling related to different types of regeneration cuttings

Gabriel DĂNILĂ, Nicolae GOICEA, Nadia DĂNILĂ

1.Introduction

During the recent years it has been noticed a greater interest in estimating the biodiversity of the forest ecosystems both as to quantity and to quality, in finding the most adequate ways of monitoring it for the propose of substantiating the conservation measures, with implications in forest management. In this respect, the research on the development way of the seedling has a special practical importance in establishing the intervention modality within the native stand.

The research was done on the eastern macroslope of Stanisoara Mountains, in mixed stands of beech-trees and coniferous trees (Forest districts: Gârcina, Văratec, Pipirig, Tg. Neamţ, Râşca, Mălini, Gura Humorului and Vama).

2.Materials and methods

The research methodology (Aubert 2005) implied choosing and studying some couples of two representative mixed stands and installing some sample plots of 5000 m^2 (Cristea 1996). One of the two stands was not thinned with regeneration cuttings and the other one had at least one cutting intervention. On each area of 5000 m^2 there were systematically placed 10 samples of 2 x 2 m (4 m^2) on the length of each diagonal for the seedling stock- inventory (Magurran 1988), as it results from figure 1.

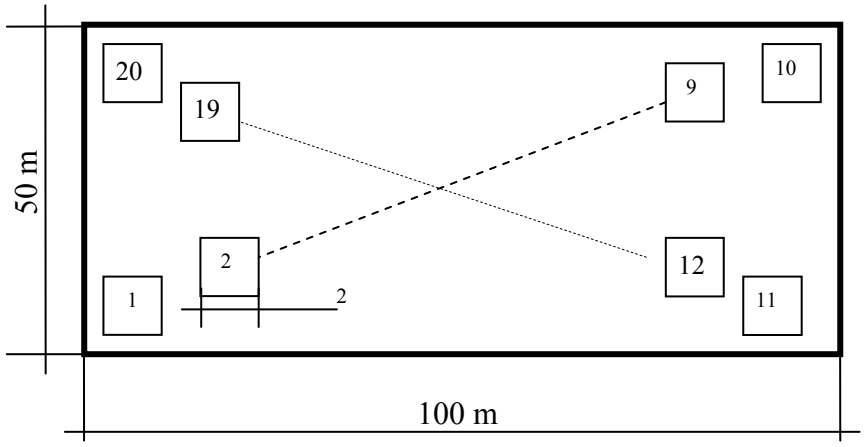

Fig. 1. Sketch of sample plot

There were placed 21 sample plot couples and 43 sample plots (variants).

The species which form the seedling were identified and counted in the twenty samples of 2x2 m, placed each ten of them on each diagonal of the sample plot. Height classes were established: below 0,5 m, 0,5-1,5 m and 1,5-2,5 m (in some cases, over); the area covered by seedling was estimated in percentage from the total area of the sample plot (Cenuşă 1996).

3. Research results

In table 1 one can see the summarized data on the average height of the seedling, the average density per hectare and the area covered by seedling in percentage. The control sample plot was written with the symbol "m" and those thinned with regeneration cuttings were written with the symbol "p". The couples were written with Roman numbers.

Table 1 The average height of the seedling, average density per hectare and the area covered by seedling in percentage

Couple	Variant	Average height (m)	Average density (ha)	Area (%)
Transformation towards single tree selection system				
III	79B m	0,504	22125	40
	3D p	0,886	8250	20
IV	19A m	0,461	32375	20
	28A p	1,277	32000	10
V	19A m	0,461	32375	40
	23 C p	0,738	5000	20
VII	174B m	1,586	12375	50
	2A p	0,601	33375	40
VIII	57C m	0,434	46875	30
	171A p	1,030	10500	10
X	54 m	1,000	30625	30
	55 p	1,047	37125	40
Shelter wood system				
I	4C m	0,652	24000	30
	4C p	0,682	16500	10
II	55C m	0,250	36375	30
	56A p	0,407	102125	60
VI	166A m	1,060	31750	30
	165A p	0,545	148875	60
IX	7A m	1,056	58250	70
	7B p	1,000	21125	10
XIV	50A m	0,332	56500	20
	40 p	0,445	143000	30
XV	38A m	0,702	18750	25
	37A p	0,815	49750	40
XVI	6B m	1,038	74750	40

	6B p1	0,613	33750	10
XVIII	44A m	1,048	34000	20
	44A p	1,186	97500	50
Clear cut / connection cuttings				
XI	38 m	1,127	20000	50
	38 p	1,867	11250	20
XII	36A	0,860	14750	40
	37A	1,825	7875	20
XIII	14F m	0,491	27625	70
	14B p	0,806	8875	20
XVI	6B m	1,038	74750	40
	6B p2	1,312	52750	20
XVII	4B m	0,968	41500	20
	4B p	1,210	108250	20
XIX	139A m	0,313	35750	10
	139A p	0,686	130750	30
XX	2D m	0,784	90750	40
	2D p	0,680	44500	20
XXI	169 A m	0,276	29000	10
	168 B p	2,000	3250	20

In order to emphasize some aspects of the seedling structure in different ways of grouping the analysed stands, a graphic representation of the regression functions (Horodnic 2004) between the average density and the average height was done (e.g. figure 2, figure 3 and figure 4).

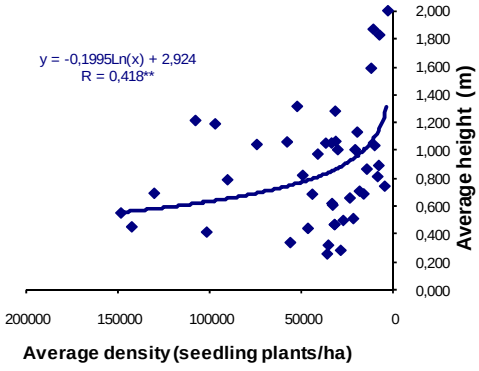

Fig. 2. The variation of the average density with the average height of the seedling for all the stands

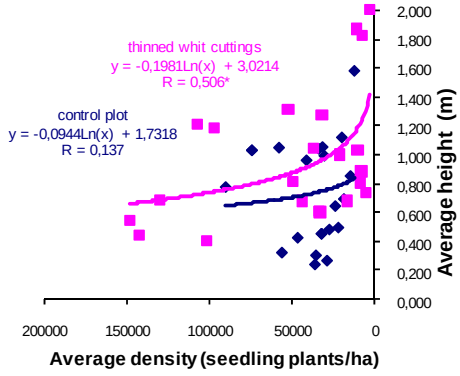

Fig. 3. The variation of the average density with the average height of the seedling for the control plot variants and those thinned with cuttings

The average height increases together with the decreasing of the average density in all the situations, significantly or not, depending on each particular case.

This situation is caused by the competition for light and mineral substances, inter and intra specific within the species which form the seedling. The natural elimination within the seedling is very strong and it represents the determinant factor for the dynamics of this layer.

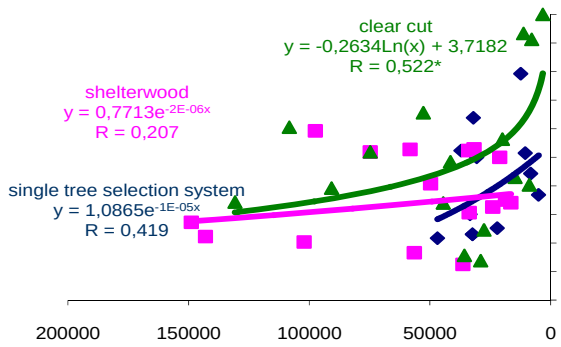

Fig.4. The variation of the average density with the average height of the seedling for the experimental devices grouped on types of cuttings

Through the comparative analysis of the graphic representations, one can notice the fact that the strongest link between the two parameters is observed at the experimental devices clear cut (fig. 4). The sudden increasing tendency of the regression function graphic is taken over both in the case of plotting the stands thinned with cuttings (fig. 3), and the stands watched as a whole (fig. 2).

In the case of shelter wood system, the correlation coefficient is insignificant, and the tendency of the regression function graphic is slightly emphasized, the cause being the destruction of the non-usable seedling (with great heights), as a result of the exploitation works. Through the repeated cuttings which characterize the shelter wood system, the installed seedling is eliminated. In this case, both the seedling composition (which changes from one intervention to another) and the health of the future stand cannot be controlled. Moreover, the application technique of the cutting regime is not observed for economical and orographical reasons or because of doubtful professionalism.

At the clear cut, after harvesting all the trees, the installed seedling can grow in height, without being destroyed by further interventions. The experimental couples thinned with transformations towards single tree selection system have low average densities of the seedling, but with relatively great heights, because this seedling is not affected too much by the harvesting interventions. The insignificant correlation coefficient may be explained by the reduced number of points which give the tendency line. The regression functions which present the highest correlation coefficient were used.

4. Discussion and conclusions

We can state that there is a strong dependence between the average height and the seedling density, fact which reflects the intensity of the elimination processes in this layer.

This correlation is weaker only in the case of the shelter wood systems because of the application technique of this cutting regime, through which the non-usable seedling is destroyed.

The development of a proper seedling from all points of view (structure, vigour) is accomplished in the stands thinned with single tree selection system. In the case of clear cut, after the installation of the massive state, the management of the future stand is easier and the certainty of a corresponding health state is a fact.

We may suggest that the specialists should decide upon some long periods of regeneration in the case of repeated cutting regimes. In this way, the diversity is preserved and the composition of the future stand is under control.

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Abstract

Aspects regarding the correlation between the average density and the average height of the seedling related to different types of regeneration cuttings

The analysis presents the correlation way between the average density and the average height of the seedling related to three types of regeneration cuttings: clear-cut, shelter wood system and single tree selection system. The analysis is also done for the stands not thinned with cuttings in comparison with those thinned with regeneration cuttings.

One can notice an interrelationship between the two characteristics studied.

Keywords: average density, average height, regeneration cuttings.

Gabriel DĂNILĂ, Nicolae GOICEA, Nadia DĂNILĂ
Forestry Faculty – "Ştefan cel Mare" University - Suceava Str. Universităţii nr. 19 Suceava 720229,
g_danila@yahoo.com