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Seed Diversity and Adaptability to Environmental Factors in Slătioara, Stulpicani Forestry, (România)

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Abstract. The present research is included in the orogenetic morph-structural Carpathian mountain structure, cristal-mesozoic sub-unit from the Oriental mountainous area. Because of the presence of limestone and dolomites in the high altitudinal area (u.a. 35B, is situated at an altitude of 1190 m), which determines additional heat in the local topoclimate, the superior limit of birch, spruce and beech mixture is higher on these rocks. In adittion, the lack of homogeneity of the landscape which determines the local presence of some phenomenon such as wind, cavitations, and thermal inversions, play an essential role in the formation of the microclimate from the study surface. It was observed that the percentage of species from the regeneration is influenced by the stational conditions that act directly on the setting and development of species, as well as their vitality. Thus, the percentage of seedlings from the 3`rd class of vitality was equal with the one of seedlings from the first class of vitality. Regarding the growth in height of seedlings, it was observed that they are well represented by beech and spruce till the height of 60 cm but also of over 100 cm, unlike the fir tree which presents an obvious reduced growth in height when over 20 cm. The secondary mix species, the maple and ash tree are concentrated in the height interval of 1-60 cm, after a while disappearing from the composition. This can be explained by the competition between species for sunlight.

Keywords: diversity, environmental factors, regeneration, seeding, stationary potential

INTRODUCTION

In the present study we will refer to a series of environmental factors and their role in determining the stationary potential, especially concerning the species diversity in natural regeneration. The study was conducted in a natural forest and consisted in gathering and processing data from the plot 35B, U.P. VIII Stătioara, Stulpicani Forestry, Forestry Department Suceava (România).

One of the most important natural processes in a forest is represented by the natural elimination. This process is triggered by inter and intra specific competition and is completed by the actions of the biotic and a biotic factors. It is carried out with different intensities and rhythms on each homogenous part and forest level in overall (Florescu, 2004).

The essential role of light is highlighted in the life of trees, ending up to be a continuous battle for light and space (Perrin, 1952).

The present study aimed was to determine the influence of the environmental factors concerning the apparition and development of seeds in a mixed natural forest (80Mo10Br10Fa), by tracking the following main objectives:

- Estimative percentage of species in the arboretum composition;
- Calculation of seedlings number per hectare;
- Distribution of the number of seedlings based on species;
- Assessing the regeneration of species;
- Distribution of seedlings based on vitality classes;
- Distribution of seedlings based on species and heights.

MATERIALS AND METHODS

In order to conduct this study, 136 circular sample surfaces with a radius of 12.63 m, having an area of 500 square meters each, placed 50 m apart, after a preset grid that covers the whole 35B plot U.P. VIII Slătioara, Stulpicani Forestry, Forestry Department Suceava (România).

Every sample area the local arboretum was inventoried based on species and diameter and 5 witness rectangular surfaces with sides measuring 1/5 m were created, one in the middle and four surfaces being distributed for each cardinal direction, as seen in Fig. 1.

The tracked parameters of the inventoried seeding inside of the witness surfaces were species, height and vitality.

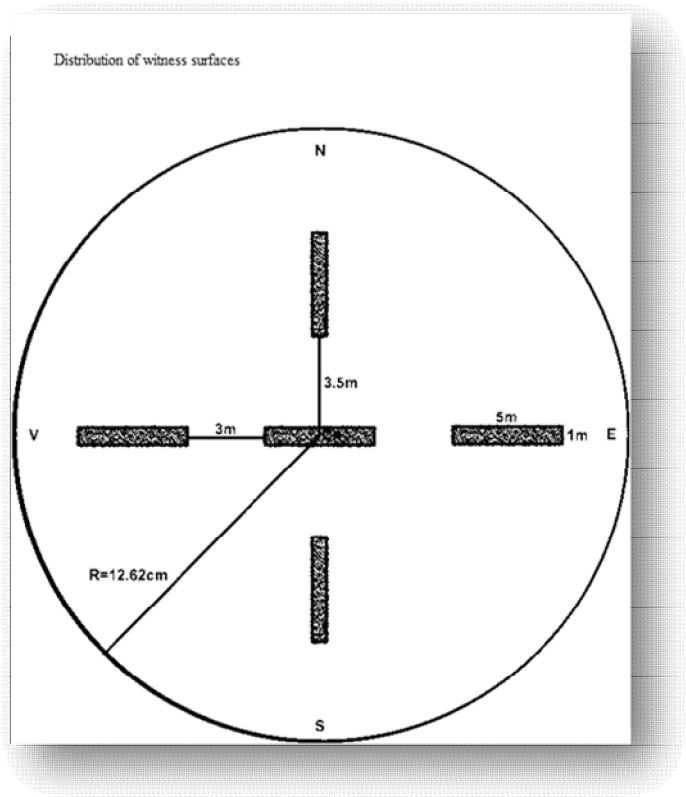

Fig. 1 Schematic representation of a test surface

RESULTS AND DISCUSSIONS

Following the base and species surface calculation (Giurgiu, 1997) of inventoried trees from the circular sample surfaces the following participation percentages were obtained, Fig. 2.

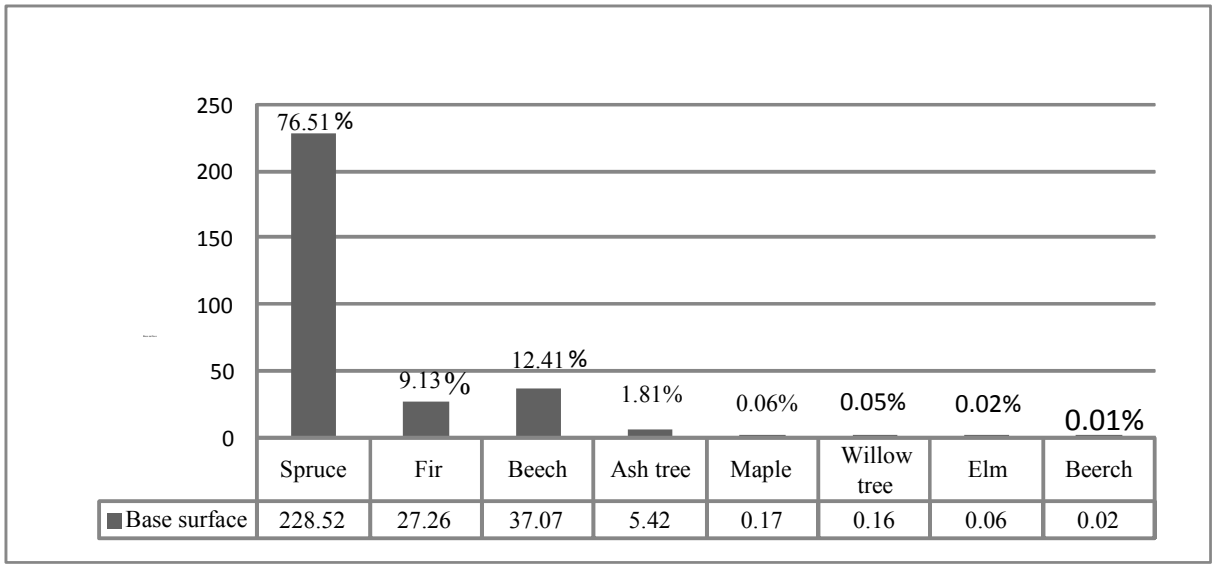

Fig. 2. Species participation in the arboretum

The total number of seedlings obtained following the inventorying from the total rectangular witness sample surfaces (S=0.34 ha) was N= 1758 seedlings, where N represents the number of seedlings, which leads to a number of 5171 seedlings per hectare. Keeping in consideration the fact that the study took place in a mixed secular forest, resinous and beech, where only natural regeneration occurs, this number represents a great success of regeneration.

The constitutive species of the inventoried seedlings were spruce, fir tree, beech as main species of the arboretum and mountain maple, commune ash tree, willow tree, mountain elm tree and birch as secondary species of mix in proportions presented in Fig. 3.

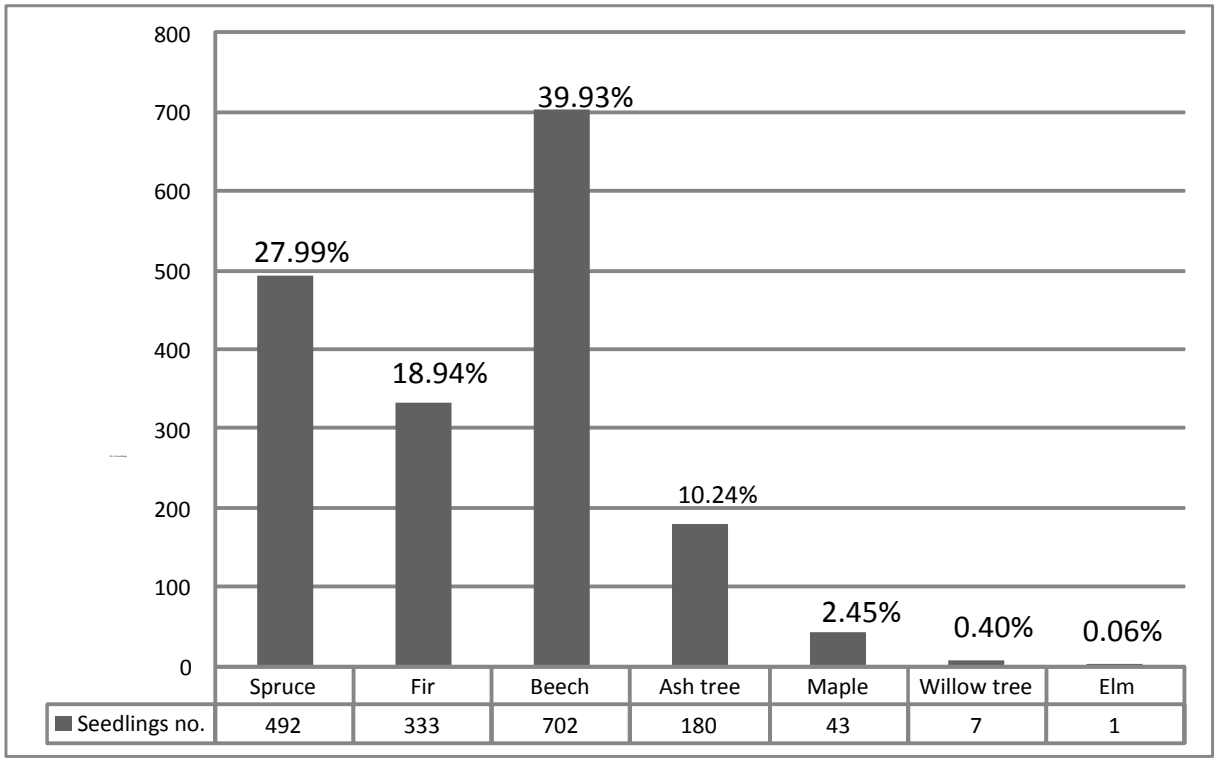

Fig. 3. Distribution based on species of the total number of seedlings

The data from the figure above also determine the regeneration composition: 28Mo19Br40Fa13Dv.

Starting from the composition of the initial arboretum 80Mo10Br10Fa, we can observe a big change in the proportions of species in the regeneration composition where the maximum participation of beech is highlighted. The large number of beech seedlings from the inventoried seedling may be due to the increase that this specie presents in the first years of life unlike fir tree or spruce. Afterwards, just like Florescu (2004) discovered, beech is matched and even overcome by those two species.

Regarding vitality, it was divided into three classes, as follows:

- Vitality class 1 – represented by seedlings with a high growth rate
- Vitality class 2 – represented by seedlings with a normal growth rate
- Vitality class 3 – represented by seedlings with a reduced growth rate.

The final results are shown in the next table:

Tab. 1

Distribution of seedlings based on vitality class

Vitality class	First class	Second class	Third class	Total
No. of seedlings	533	717	508	1758
Proportion	30.32%	40.78	28.90%	100%

The distribution of seedlings based on vitality classes presents great differences, the number of seedlings from the first and third class being almost equal and the one in the middle being approximately 10% higher (Tab. 1).

We can also mention the fact that the spruce tree, because of the minor growth in the early years, after the plantlet state, has reduced seedling vitality because the growths after this moment are always smaller than the ones from the plantlet state; equalizing the other species in terms of height, being much later. In these conditions, the small number of fir tree and spruce seedlings is explicable in the first years of life.

The values obtained are in normal range if reported to the type of station of the landscape unit taken into study, the ”Mountain spruce stands” – Ps, brown acid, grand and small edafic with Oxalis-Dentaria, acidophilic, FM_3 Bm (s) $T_{IV\text{-}V}H_{II}Ue4$.” (Moțiu, 2008; Dumitru, 2010).

Accelerated growth periods appear at the seedling level in the natural forest and by placing them in direct light following the falling of trees caused by wind (Popa, 2002).

Tab. 2

Distribution of seedlings based on species and heights

Species/Heights(cm)	1-20	21-60	61-100	>100	Total
Spruce	143	161	51	137	492 (27.99)
Fir tree	211	49	7	66	333 (18.94%)
Beech	207	185	87	223	702 (39.93%)
Ash tree	152	28	0	0	180 (10.24%)
Mountain maple tree	39	4	0	0	43 (2.45%)
Willow tree	0	5	0	2	7 (0.40%)
Elm tree	0	0	1	0	1(0.06)
Total	752	432	146	428	1758 (100%)

In the case of the beech tree, the influence of light on fructification is obvious for each tree, different parts of the corona, having different seed productions, depending on the quantity of light received (Costăchescu, 2006).

For a more relevant result regarding the distribution of seedlings based on species and heights, the second table was created.

The percentage of fir tree seedlings is significantly lower starting from the first to the following height classes compared to the beech tree and spruce tree, inexplicable fact due to the differences in rooting, even from the first years of life. These appear because the spruce tree develops in this period, especially in the aerial part and the fir tree develops its root mostly (Brega, 1986).

The main secondary mix species, based on percentage, is the common ash tree, by having a proportion of 10.24%, almost five times bigger than the mountain maple tree. This fact is due to good anemochore dissemination (Clinovschi, 2005) of the ash tree, seeds that developed seedlings due to favorable soil conditions.

A regeneration of this species is practically impossible, because the common ash tree is a specie with temper to light, so the possibility of seedling development are amount null if we take into consideration the general coverage of the main species canopy and the lack of ash three in the higher level.

Thus, we can say that in the case of the ash tree we can talk about a temporary seedling, which appears with the first fructification but mostly because of the lack of light, it disappears after a few years (Negulescu, 1973; Nicolescu, 2008).

On the other side, although there are many ash trees in the seedling, in the arboreal layer, the ash tree is not present in the study field. Also, more than 80% from the total of these seedlings reach heights of about 20 cm, only 15.56% are between 21-60 cm and no seedling was more than 60 cm .

Concerning the growth and development of the mountain maple tree, Brega (1986) shows that the seedlings cannot stand shading for more than 4 years and in case the shade is extended, the seedlings lose their growth rapidity and are exceeded by the seedlings of beech that have a better tolerance of shade. Compared to ash trees, the maple tree is found in the arboreal layer because it can endure some shade due to the foliar mosaic, as shown by Clinovschi (2005).

CONCLUSIONS

The proportions of participation of the constitutive species are determined directly by the stationary factors, as they are decisive in the first years of the seedlings life.

The values obtained are in normal range if reported to the type of station of the landscape unit taken into study, the mountain spruce stands.

Especially the growths in height are directly determined by the quantity of light that reaches the seedlings existing horizon.

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REFERENCES

1. Brega, P. (1986). Regenerarea naturală a făgetelor, brădetelor şi amestecurilor de răşinoase cu fag în nordul ţării, p. 108-110. Editura Ceres, Bucureşti.

2. Clinovschi, F. (2005). Dendrologie, p.19. Editura Universităţii Suceava.
3. Costăchescu, C. (2006). Instalarea seminţişurilor de fag în arboretele din bazinul mijlociu al Buzăului, p. 149- 159. Analele ICAS, 49.
4. Dumitru, I. and D. Dumitru (2010). Pădurea, factor esenţial în protecţia mediului, p. 141. Editura Petru Maior, Reghin.
5. Florescu, I. (2004). Silvicultură, p. 66-101. Editura Vasile Goldiş, Arad.
6. Moţiu, P. (2008). Îndrumar de lucrări practice la staţiuni forestiere, p. 3-5. Editura Universităţii din Oradea.
7. Negulescu, E.G., V. Stănescu, I.I. Florescu and D. Târziu (1973). Silvicultură, vol. I şi II, p. 557. Editura Ceres, Bucureşti.
8. Perrin, H. (1954). Sylviculture II: Le traitement des forets théorie et pratique des techniques sylvicoles, Editions Ecole Nationale des Eaux et Forets, Nancy, p. 411.
9. Popa, I. (2002). Elaborarea de serii dendrocronologice pentru molid, brad şi gorun cu aplicabilitate în dendroclimatologie şi dendroecologie, Analele ICAS, 45. p. 237-250. Editura Tehnică Silvică.
10. Ştefan, V. (1994). Influenţa luminii asupra creşterii în înălţime a seminţişului de brad, Revista Pădurilor nr. 2.