THE CLASSIFICATION OF NATURAL BEECH POPULATIONS STUDIED BY THE INDEX OF EVALUATION

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Abstract

The analysis of intra specific variation of woody species can be achieved either by observation and comparative measurement of the character made on material taken from natural forest stands, either by experimental comparative cultures. For natural stands the condition was that they should be sufficiently large and dense that normal genetic recombination is possible between trees, isolated from the related species and varieties with which it can inter fertilize, to be mature to produce seed for estimating the production, stem form, crown architecture, etc.. It was considered a large enough area so that geographical variation of the main environmental factors were ***(Enescu, 1973, 1977).***

Key words: average index, comparative cultures, slenderness, annual rings.

INTRODUCTION

The evaluation of genetic resources of beech stands was performed on natural populations in each of these being elected by 30 beech trees, dominant and co dominant, moved away from each other at least 30 m (for seed trees to represent in terms of frequency of genotypes and gene average improvement of the population - so that the information acquired on the characters studied to correspond to the existing genetic information in the population considered) using the criterion of representativeness.

Healthy trees were chosen, located in the dominant ceiling and whose phenotype has not changed due to factors outside the station (in operation wounds, tears of snow, etc.). The trees chosen were individualized.

In order to deepen knowledge on the variability of beech in natural populations it started from the research of some representative populations, in which the considered specimens have come to exploit abundant, which means that hereditary characters were fixed.

MATERIAL AND METHOD

Based on a study made on the beech in the area northwest, west and southwest of our country and given the zoning of regions of origin (Enescu, Doniță et all., 1976) were sampled 28 representative panmictic natural populations for the harvesting areas so as to better cover the natural range of beech in this part of the country.

There were studied beech populations from the following 10 ecological sub-regions: A 1-2 populations: Baia Mare and Mara; F 1-2 populations: Caransebeş and Teregova; F 3-7 populations: Anina, Băile Herculane, Bozovici, Mehadia, Nera, Reşița and Văliug; F 4-2 populations: Coşava and Făget, G 1-4 populations: Beliu, Gurahonț, Hălmagiu and Sebiş-Moneasa, G 2-5 populations: Aleşd, Dobreşti, Remeți, Sudrigiu and Vaşcău; G 3 - 2 populations: Gilău and Huedin; G 4-2 populations: Cîmpeni and Gârda; H 1-1 population: Marghita and H 2-1 population: Târgu Lăpuş (Andra Ienciu, 2004).

For a more accurate assessment of beech genes resources were made studies regarding the variability of beech in the populations sampled with biostatistics methods.

There have been made investigations of biometrics on the crown and stem architecture, morphology, ecology and others. The research was conducted on existing biological material or taken to/ from wood (Andra Ienciu, Savatti, 2004).

In the populations sampled were chosen by 30 trees representative for each population. There have been made observations and measurements for 27 characters, either by direct measurements on trees, or by estimates.

There were performed measurements on quantitative characters: height (m), stem diameter (cm) and crown (m), slenderness (ratio between total height and trunk diameter), trunk volume (m3), height to the first prune branch (m), crown height (m), density (conventional) of wood (g/cm3), the total thickness of annual rings (the last 20 years) (mm) given the indications of some authors (Dumitriu-Tătăranu, Ghelmeziu, Florescu şi colaboratorii, 1983; Holz, 1959; Smith, 1955).

The populations studied were classified according to indices of evaluation which were calculated taking into account the performance of growth (height, diameter, volume), quality indices (characters of the crown and trunk), indices of adaptation (adaptation characters) and quality of wood (the wood characters).

For measured characters were used the following notations: 0 if the measured value was lower than the average standard deviation of three units (σ), 2 if it was less than 2σ, 4 if it was less than 1σ, 6 if the measured value was evaluated around the average experience, 8, 10, and 12 when the measured value exceeded by 1 or 2 and 3 σ the average experience (Ciobanu, 2003).

For the observed characters and designated by index, the scoring system for the signs of evaluation considered the used index for each character separately, keeping the same hierarchy as for the measured characters.

RESULTS AND DISSCUSIONS

For each studied population the average index of evaluation was examined, separately for the quantitative characters of the trunk and crown, and qualitative characters of the trunk, adaptation and referring to the quality of wood, then calculating an overall average index (Table 1).

After the quantitative characters of the trunk at the top of evaluation are the population 24-Nera followed by the 27-Huedin population, 22-Caransebeş, 13-Baia Mare, 14-Mara, 9-Sebiş-Moneasa, 18-Văliug and 21-Teregova. Populations located in the top vegetate, generally at medium altitudes not exceeding 600-850 m, but two of them growing at altitudes exceeding 1000 m.

Populations that gave the best results in terms of character growth vegetate on the soil type eutricambosoil, but two populations, namely 24-Nera and 21-Teregova growing on districambosoil. At the bottom of the ranking is situated 8-Gârda population, the rest of the populations having average performance with regard to these characters. It should be noted that the population of 8-Gârda is the highest altitude of all populations studied, vegetating at 1000-1350 m and growing on the soil type redzine which rarely meets the tested. If the index of evaluation is calculated after the qualitative characters of tree trunk is found that the populations 4-Marghita and 23-Mehadia detaches net occupying the first places.

The first population vegetates at an altitude of 540-660 m, and the second at an altitude of 675-730 m on the soil type eutricambosoil.

The weakest performances were recorded for populations 19-Reşiţa, 20-Anina, 21-Teregova, 24-Nera and 25-Bozovici. The rest of the population studied showed average values for this type of character.

If the index of evaluation is calculated regarding the crown characters a detach of five populations in the top of the ranking is found 3-Remeți, 10-Beliu, 23-Mehadia, 25-Bozovici and 26-Băile Herculane. The populations 10-Beliu and 25-Bozovici grow at altitudes between 400-600 m, and other populations at altitudes over 600 m, and the soil type characteristic to these populations is eutricambosoil, except for the last population that grows on redzine.

A value very close to the top of the ranking had five other populations: 1-Dobreşti, 9-Sebiş-Moneasa, 13-Baia Mare, 14-Mara and 24-Nera, of which only 14-Mara population vegetates at an altitude higher than 900 m, the remaining populations growing at altitudes between 400-850 m. The soil type on which these populations vegetate is eutricambosoil for the first three and districambosoil for the other two. The weakest performances were recorded for the populations 17-Coşava, 19-Reşiţa, 21-Teregova and

22-Caransebeş. The rest of the populations studied showed average values for this type of character.

Table 1

Indices of evaluation for different characters of natural beech population from the west side of the country

No.	Popula-tion	Average index of evaluation					Total index of evalu-ation
		Quantitative characters of the trunk	Qualitative characters of the trunk	Characters of the crown	Other characters of the trunk - to adapt	Characters of the wood	
1.	Dobreşti	44	12	36	34	28	144
2.	Sudrigiu	44	18	28	32	20	108
3.	Remeți	34	12	38	34	26	96
4.	Marghita	42	24	32	30	22	106
5.	Aleşd	32	12	24	28	14	96
6.	Vaşcău	40	18	28	18	20	88
7.	Hălmagiu	30	18	20	16	10	68
8.	Gârda	24	12	28	6	20	58
9.	Sebiş-Moneasa	52	18	36	12	20	90
10.	Beliu	48	12	38	24	20	112
11.	Gurahonț	38	18	30	20	10	84
12.	Câmpeni	44	12	22	26	20	108
13.	Baia Mare	52	18	36	12	26	100
14.	Mara	52	12	36	10	12	80
15.	Târgu Lăpuş	44	12	26	18	10	82
16.	Făget	34	12	22	26	10	86
17.	Coşava	42	12	12	20	14	90
18.	Văliug	50	12	26	12	20	96
19.	Reşița	38	6	12	16	18	88
20.	Anina	36	6	18	8	16	70
21.	Teregova	50	6	12	10	10	80
22.	Caransebeş	54	18	12	6	18	92
23.	Mehadia	44	24	38	8	18	82
24.	Nera	62	6	36	12	28	108
25.	Bozovici	44	6	38	14	20	92
26.	Băile Herculane	44	18	38	12	22	90
27.	Huedin	56	12	16	6	12	80
28.	Gilău	42	12	18	12	14	74

In terms of adapting characters, three populations detach: 1-Dobreşti, 3-Remeți and 2-Sudrigiu. Values close to those have registered the populations 4-Marghita and 6-Aleşd.

The highlighted populations vegetate in general, at small and medium altitudes, a single population, namely, 3-Remeți is growing to heights exceeding 900 m. In what the type of soil concerns, it was observed that all populations have proven well adapted to the environment growing on soil type eutricambosoil.

The least adapted populations proved 8-Gârda, 22-Caransrbeş and 27-Huedin. Poor results in terms of adaptation were also recorded at

populations 20-Anina and 23-Mehadia, the general population showing an average capacity to adapt.

After wood characters stand the populations 1-Dobreşti, 24-Nera followed by 3-Remeți populations and 13-Baia Mare. Populations located in the top grow at altitudes often exceeding 600 m, the soil on which they vegetate is eutricambosoil, except 24-Nera population growing on a soil type districambosoil. The worst results in this population have shown 7-Hălmagiu, 11-Gurahonț, 15-Târgu Lăpuş, 16-Făget and 21-Teregova. Poor results in terms of wood quality have registered populations 14-Mara, 27-Huedin, 5-Aleşd, 17-Coşava and 28-Gilău. Other populations studied showed average performance in terms of wood quality.

If we consider all the studied characters, it shows a net population 1-Dobreşti, followed by 4-Marghita population. Population ranked among the top lies populations 3-Remeți, 13-Baia Mare and 24-Nera, followed by 2-Sudrigiu populations and 10-Beliu, 9-Sebiş-Moneasa, 26-Băile Herculane and 23-Mehadia. 1-Dobreşti population located in the top vegetates at an average altitude of 400-680 m for beech namely on a eutricambosoil soil type. Other highlighted populations also increase at medium altitudes, and in what the soil concerns, they grow on eutricambosoil, existing two populations, 24-Nera and 26-Băile Herculane to vegetate on the soil type districambosoil, respectively redzine.

The populations which had the worst performances when taking into account of all the characters studied, were 21-Teregova and 20-Anina. For other populations were recorded average performances from all the characters studied.

Within each ecological sub-region were established, from each of the population studied, the most valuable populations, based on the scoring from the populations evaluation. This score was separately calculated for quantitative and qualitative characters of the trunk, the crown, adapting characters and character of wood, and global indices of all the characters considered.

A. Nordic Eastern Carpathians

Sub-region A_1: Maramureş: In this sub-region have been studied two populations, namely 13-Baia Mare and 14-Mara. Of these two populations, it is recommended for this sub-region for the selection the population 13-Baia Mare, which scored well in terms of quantitative characters of the trunk and characters of the wood, being indicated to use as reproductive forest material type for the selected source in this harvest area.

F. Banat Mountains

Sub-region F_1: Țarcu Godeanu: In this sub-region have been studied two populations, namely 21-Teregova and 22-Caransebeş. In this sub-region it is recommended for the selection the population 22-Caransebeş, which boasts

a good score for the quantitative characters of the trunk and implicitly for the wood production.

Sub-region F_3: Almaj-Semenic: From this sub-region were studied seven populations, being recommended for the selection the population 24-Nera, which had the best overall index for all characters, but also the populations 26-Băile Herculane and 23-Mehadia for good scores at the quantitative characters of the trunk and characters of the wood and are therefore indicated for use as forest reproductive material source type selected for this area of harvest.

Sub-region F_4: Poiana Ruscă: In this sub-region have been studied two populations, namely 16-Făget and 17-Coşava. From this sub-region it is recommended for the selection the population 16-Făget, who has an average score for the crown characters indicating high vegetation vigour and for the adaptation characters, proving thus quite well suited to stationary conditions.

G. Apuseni Mountains

Sub-region G_1: Zărand-Metaliferi: From this sub-region were studied four populations, recommending for the selection the populations 10-Beliu and 9-Sebiş-Moneasa, which had high scores for all characters, as for the total index of evaluation, these populations are indicated to be used as forest reproductive material type source selected for this harvest area.

Sub-region G_2: Pădurea Craiului: In this sub-region were studied five populations, which are 1-Dobreşti, 2-Sudrigiu, 3-Remeți, 5-Aleşd and 6-Vaşcău. Among these populations it is recommended for the selection three populations, namely 1-Dobreşti, 2-Sudrigiu and 3-Remeți, the first being superior to all the characters considered, the second having high scores for the quantitative and qualitative characters of the trunk and the last one for the crown, adaptation and wood characters. These three populations can therefore be a source of forest reproductive material selected for this area of harvest.

Sub-region G_3: Vlădeasa-Gilău: From this sub-region have been studied two populations, namely 27-Huedin and 28-Gilău. Although the population 27-Huedin has high values for the quantitative characters of the trunk, for other character types these values are weak, global index of evaluation is below the experiment. The same can be done for 28-Gilău population, but this having lower values for the quantitative characters of the trunk, so these populations are not recommended for use as forest reproductive material for this harvest area.

Sub-region G_4: Trascău-Muntele Mare: In this sub-region have been studied two populations, namely 8-Gârda and 12-Câmpeni. Of these two populations it is recommended for the selection the population 12-Câmpeni, showing high scores for quantitative characters of the trunk and of the

adaptation and can be used as forest reproductive material of selected source type.

H. Someş Platform

Sub-region H_1: Someş Plateau: From this sub-population we studied a single population that is 4-Marghita. This population, although it presents average values for quantitative characters of the trunk, showed high values for qualitative characters of the trunk, characters of adaptation and wood characters and a great global index for all characters, and can therefore be selected to be used as forest reproductive material of selected source type.

Sub-region H_2: Ciceului Hills: In this sub-population has been studied a single population and that is 15-Târgu Lăpuş. This population has low levels for all characters studied, as well as global index of all the characters and so is not recommended for use as forest reproductive material for this harvest area.

Such selected populations can therefore be used as forest reproductive material source type selected after law nr.161/2004 on the production, sale and use of forest reproductive material, each corresponding to this law.

CONCLUSIONS

After **quantitative characters of the trunk** the most valuable populations were 24-Nera, 27-Huedin, 22-Caransebeş, 13-Baia Mare, 14-Mara, 9-Sebiş-Moneasa, 18-Văliug and 21-Teregova, so quite a big number of the studied populations are high valuable in terms of these types of characters. These populations vegetate at altitudes and on different soils, so different environmental conditions determined the good behaviour of the backgrounds in terms of growth.

In terms of **qualitative characteristics of the trunk**, the most valuable proved to be the populations 4-Marghita and 23-Mehadia. These populations are growing in similar conditions, on base soil, but at different altitudes.

From **the crown characters** are found that in the top are five populations namely 3-Remeți, 10-Beliu, 23-Mehadia, 25-Bozovici and 26-Băile Herculane. These populations vegetate at different altitudes, but the type of soil on which they grow is approximately the same namely the base soil, except the last population which vegetates on redzine.

According to **other characters of the trunk – adaptation characters**, in the top are the populations 1-Dobreşti, 3-Remeți, 2-Sudrigiu, 4-Marghita and 5-Aleşd. These populations vegetate at different altitudes, but the type of soil on which they grow is approximately the same namely base soil.

Regarding some **wood characters**, the most valuable populations proved to be 1-Dobreşti, 24-Nera and 13-Baia Mare. These populations grow at medium altitudes, the soils on which they vegetate that are basic and acidic.

After all characters considered the most valuable were the populations 1-Dobreşti, 4-Marghita, 3-Remeți, 13-Baia Mare, 24-Nera, 2-Sudrigiu, 10-Beliu, 9-Sebiş-Moneasa, 26-Băile Herculane and 23-Mehadia. These populations vegetate under different conditions, in terms of altitude they increased both at medium as at high altitude, the soil type being varied.

Within each ecological region have been established the most valuable populations on the score obtained at the population evaluation, these populations can be used as forest reproductive material selected source type. These populations were: sub-region A1-population 13-Baia Mare, sub-region F1-population 22-Caransebeş, sub-region F3-population 24-Nera, 26-Băile Herculane and 23-Mehadia, sub-region F4-population 16-Faget, sub-region G1 population 10-Beliu and 9-Sebiş-Moneasa, sub-region G2-population 1-Dobreşti, 2-Sudrigiu, 3-Remeți, sub-region G4-population 12-Câmpeni and sub-region H1-population 4-Marghita.

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