ANALYSIS OF GENOTYPIC AND PHENOTYPIC TRAITS IN NATURAL POPULATIONS OF BEECH IN THE WESTERN AREA OF ROMANIA (II)

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Abstract

The success of a breeding programme is directly related to its own genetic variability resources. Duet to this fact, at the beginning of any breeding activity, there is an urgent need to know and evaluate the existent variability of the available resources, and to create the variability through conventional and unconventional methods.

Key words: rhitydom, interpopulational, slemderness, trunk forking, quantitative characters

INTRODUCTION

Across the immeasurable riches of intraspecific genetic diversity due to species in Europe and in Romania is linked to a large extent, the scope, often very high, areas with very diverse site conditions. The rational use of genetically improved forest reproductive material is of great importance to forestry, especially for wood production and resistance to adversity (adaptability). Any genetic improvement program based on the fund genes (gene pool) existing natural populations and, therefore, they must be preserved.

MATERIAL AND METHOD

Interpopulational variability study of beech in 16 natural populations of beech sampled, aged up to 100 years, was performed using the methods of biostatistics (Mateescu, 2005; Kent, Weir, 2009). In each population studied was chosen by 30 beech trees using the criterion of representativeness, each measuring the tree and observing each 27 characters or trees directly or through estimates, the resulting data is processed by simple analysis of variance (Ceapoiu, 1968; Ciobanu, 2003; Schneider, 2011; Wade, 2007). Data analysis was performed after hours Statistics, 1991.

When selecting populations were taken into account both height as the main ecological gradient in the area of Romanian beech and stationary condition varied due to different environmental factors (Enescu, Doniţă, Bândiu et al., 1988, Ienciu Andra, Savatti, 2004). For the study of interpopulation variation of the population this group up to 100 years were divided into two groups of elderly: the first between 61-80 years - five populations: 11-Gurahonţ (72 years old, CP II), 14-Mara (72 years old, CP II), 16-Făget (72 years old, CP II), 23-Mehadia (80 years old, CP I) and 28-Gilău (65 years old, CP III), and the second between 81-100 years comprising ten populations as follows: 2-Sudrigiu (93 years old, CP II), 4-Marghita (89 years old, CP I), 5-Aleşd (81 years old, CP I), 9-Sebiş-Moneasa (82 years old, CP I), 17-Coşava (97 years old, CP II), 20-Anina (85 years old, CP II), 21-Teregova (90 years old, CP II), 22-Caransebeş (91 years old, CP I), 25-Bozovici (90 years old, CP II) and 27-Huedin (90 years old, CP II) being excluded Târgu Lăpuş 15 people who do not fit in any subgroup.

RESULTS AND DISSCUSIONS

The study variation interpopulational 81-100 years age group, revealed that variation coefficients were different from one character to another (Table 1).

Table 1

Statistical indicators of characters measured or observed in beech populations aged up to 100 years in the west - the age group 81-100 years

No.	Character	$\bar{x} \pm e$	σ	cv
1.	Diameter la 1,3 m (cm)	34,527±0,960	3,037	8,796
2.	Total height (m)	29,096±1,008	3,187	10,953
3.	The height to the first branch ellagic (m)	13,425±1,052	3,329	24,797
4.	Slenderness (Hm/Dcm)	0,890±0,049	0,156	17,528
5.	Trunk volum (m^3)	1,497±0,065	0,206	13,760
6.	Forking trunk (indici)	1,548±0,080	0,254	16,408
7.	Cylindric trunk (indici)	1,403±0,056	0,177	12,615
8.	Rectitude trunk (indici)	2,076±0,131	0,417	20,086
9.	Trunk shape base (indici)	2,025±0,064	0,205	10,123
10.	Pruning (indici)	1,266±0,074	0,234	18,483
11.	Bark color (indici)	2,060±0,057	0,181	8,786
12.	Shape color (indici)	1,273±0,059	0,188	14,768
13.	Rhitidom (indici)	1,302±0,087	0,275	21,121
14.	Rhitidom shape (indici)	0,552±0,149	0,474	85,869
15.	Crown diameter (m)	8,271±0,484	1,533	18,534
16.	Crown height (m)	15,575±0,661	2,091	13,425
17.	Vertical funnel shaped crown (indici)	2,956±0,160	0,507	17,151
18.	Symmetry crown (indici)	1,410±0,031	0,099	7,021
19.	Thick branches (indici)	1,793±0,069	0,221	12,325
20.	Insertion angle of branches (indici)	1,866±0,080	0,255	13,665
21.	Position branches (indici)	1,674±0,035	0,111	6,630
22.	Chinese beards (indici)	1,457±0,081	0,259	17,776
23.	Frost shape (indici)	1,240±0,066	0,211	17,016
24.	Spun fiber (indici)	1,518±0,103	0,327	21,541
25.	Wood density (g/cm^3)	0,571±0,019	0,060	10,507
26.	The total thickness of annual rings (mm)	35,424±0,637	2,016	5,691
27.	False heartwood (indici)	0,216±0,069	0,219	101,388

Phenotypic variation of quantitative characters of tree trunk for this age group was average diameter of 1,3 m excluding slenderness and trunk volume that showed little variation. The only character that showed a coefficient of variation was greater height to the first branch ellagic with a value of 24,797%.

For this age group interpopulational variation of characters qualitative torso as trunk forking, cylindric trunk, straightness of the trunk, torso-shaped base, pruning, form crust and rhitidom was average variation coefficients hovering around 20%.Un alt caracter al trunchiului cum este culoarea scoarţei a avut valori mult mai mici, coeficientul de variaţie fiind de numai 8,786%. Another character is the color of the bark of the trunk as was much lower coefficient of variation of only 8,786%. Wide phenotypic variation observed in the case formalize rhitidom coefficient of variation being 85,869%.

Referring to crown some characters are found in the age group 81-100 years that crown diameter, crown height, crown shape in vertical thickness insertion angle of branches and branches have average variation coefficients of variation not exceeding 20%.

Table 2

Statistical indicators of characters measured or observed in beech populations aged up to 100 years in the west - age group 81-100 years and production class I

No.	Character	$\bar{x} \pm e$	σ	cv
1.	Diameter la 1,3 m (cm)	34,742±1,173	2,347	6,759
2.	Total height (m)	31,350±0,573	1,147	3,658
3.	The height to the first branch ellagic (m)	15,202±2,003	4,007	26,358
4.	Slenderness (Hm/Dcm)	0,935±0,032	0,064	6,844
5.	Trunk volum (m^3)	1,599±0,110	0,221	13,821
6.	Forking trunk (indici)	1,542±0,098	0,196	12,710
7.	Cylindric trunk (indici)	1,482±0,054	0,109	7,354
8.	Rectitude trunk (indici)	2,365±0,143	0,286	12,093
9.	Trunk shape base (indici)	2,040±0,051	0,102	5,000
10.	Pruning (indici)	1,300±0,113	0,226	17,384
11.	Bark color (indici)	2,057±0,058	0,117	5,687
12.	Shape color (indici)	1,224±0,105	0,211	17,238
13.	Rhitidom (indici)	1,165±0,123	0,246	21,115
14.	Rhitidom shape (indici)	0,312±0,231	0,463	148,397
15.	Crown diameter (m)	7,692±0,590	1,180	15,340
16.	Crown height (m)	15,932±1,281	2,563	16,087
17.	Vertical funnel shaped crown (indici)	3,057±0,184	0,369	12,070
18.	Symmetry crown (indici)	1,390±0,057	0,114	8,201
19.	Thick branches (indici)	1,735±0,128	0,257	14,812
20.	Insertion angle of branches (indici)	1,957±0,115	0,230	11,752
21.	Position branches (indici)	1,617±0,062	0,125	7,730
22.	Chinese beards (indici)	1,392±0,140	0,280	20,114
23.	Frost shape (indici)	1,232±0,101	0,203	16,477
24.	Spun fiber (indici)	1,360±0,176	0,352	25,882
25.	Wood density (g/cm^3)	0,608±0,013	0,026	4,276
26.	The total thickness of annual rings (mm)	36,167±0,645	1,291	3,569
27.	False heartwood (indici)	0,182±0,077	0,154	84,615

In exchange for the crown and position symmetry variation recorded was lower branches, coefficients of variation were obtained for 7,021% and 6,630%.For other characters torso - adapting characters such as Chinese and frost shape beards, they showed interpopulational variability coefficients of variation not exceeding 20%.

Study of characters of wood trees such as fiber torsion phenotypic variation revealed a very wide range and if false heartwood and wood density, one average population in this age group. Instead overall thickness of annual rings had little variation, the variation coefficient of only 5,691%.

The study interpopulational variation 81-100 years age group and class production highlights the existence of four populations with the same class production - I - 4-Marghita, 5-Aleşd, 9-Sebiş-Moneasa and 22-Caransebeş, also six more populations production class II – 2-Sudrigiu, 17-Coşava, 20-Anina, 21-Teregova, 25-Bozovici and 27-Huedin. This study revealed that the coefficients of variation were different from one character to another (Tabel 2 and 3).

Table 3

Statistical indicators of characters measured or observed in beech populations aged up to 100 years in the west - age group 81-100 years and production class II

No.	Character	$\bar{x} \pm e$	σ	cv
1.	Diameter la 1,3 m (cm)	34,383±1,485	3,639	10,583
2.	Total height (m)	27,593±1,337	3,275	11,868
3.	The height to the first branch ellagic (m)	12,240±1,008	2,469	20,171
4.	Slenderness (Hm/Dcm)	0,860±0,080	0,196	22,790
5.	Trunk volum (m^3)	1,429±0,074	0,182	12,736
6.	Forking trunk (indici)	1,551±0,124	0,306	19,729
7.	Cylindric trunk (indici)	1,350±0,082	0,202	14,962
8.	Rectitude trunk (indici)	1,883±0,159	0,390	20,711
9.	Trunk shape base (indici)	2,015±0,107	0,263	13,052
10.	Pruning (indici)	1,243±0,105	0,258	20,756
11.	Bark color (indici)	2,061±0,091	0,225	10,917
12.	Shape color (indici)	1,306±0,075	0,184	14,088
13.	Rhitidom (indici)	1,393±0,112	0,274	19,669
14.	Rhitidom shape (indici)	0,711±0,182	0,446	62,728
15.	Crown diameter (m)	8,656±0,701	1,717	19,835
16.	Crown height (m)	15,336±0,791	1,938	12,636
17.	Vertical funnel shaped crown (indici)	2,888±0,247	0,607	21,018
18.	Symmetry crown (indici)	1,423±0,039	0,096	6,746
19.	Thick branches (indici)	1,831±0,085	0,209	11,414
20.	Insertion angle of branches (indici)	1,805±0,111	0,272	15,069
21.	Position branches (indici)	1,711±0,038	0,093	5,435
22.	Chinese beards (indici)	1,500±0,106	0,260	17,333
23.	Frost shape (indici)	1,245±0,096	0,236	18,955
24.	Spun fiber (indici)	1,623±0,119	0,292	17,991
25.	Wood density (g/cm^3)	0,546±0,027	0,066	12,087
26.	The total thickness of annual rings (mm)	34,928±0,964	2,362	6,762
27.	False heartwood (indici)	0,283±0,108	0,265	11,344

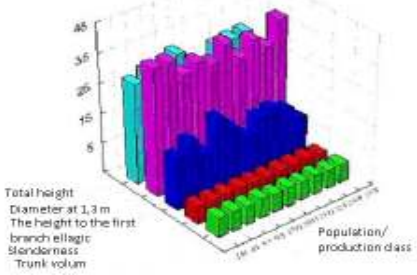
$\bar{x} \pm e$ – mediate ± media error
σ – standard deviation
cv – coefficient of variation

Phenotypic variation in quantitative characters populations of tree trunk with production class I was little except height to the first branch ellagic who presented a wide variation and volume variation middle stump. Instead populations class II production phenotypic variation was average for these characters except height to the first branch and prune slenderness who showed a wide variation.

Changes interpopulational of characters qualitative torso populations in grade I-a production as cylindric torso shape of the trunk at the base and colored bark was small, and for trunk forking, straightness of the trunk, pruning and form the crust was average values coefficients of variation hovering around 20%. A large and very large phenotypic variation observed for rhitidom character and form rhitidom coefficients of variation being 21,115% and 148,397%. For class II production was medium interpopulational variation for most characters, except rectitude trunk , trees, pruning and shape rhitidom, who showed a wide variation .

Referring to some characters crown populations are found in both production classes that symmetry crown and branches have a small change in position, otherwise the other characters had an average variation coefficients of variation not exceeding 20%.

For other characters torso - adapting characters such as Chinese and frost shape beards, they showed a wide variability respectively interpopulational populations middle class I a production for both characters and middle class II populations production .



. Figure 1. Variation in quantitative characters of the trunk on the population studied in the age group 81-100 years

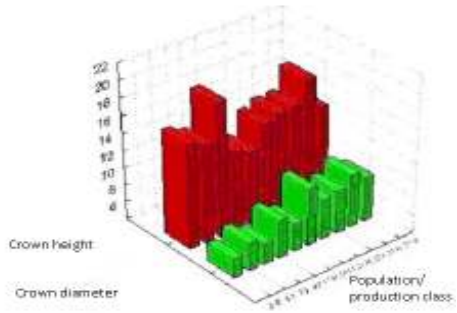


Figure 2. Variation characters crown on the population studied in the age group 81-100 years

Study of characters of wood trees such as fiber torsion phenotypic variation revealed a very wide range and if false heartwood and wood density and total thickness of annual rings, a small variation for populations in class production. Instead populations class II production variability

interpopulational had a mean except that the total thickness of tree rings showed little variation, the variation coefficient of only 6,762%.

If the group of 81-100 years, it was found that in terms of diameter 1.3 m, the highest values were recorded for populations 2-Sudrigiu, 4-Marghita, 20-Anina and 27-Huedin, and the total height and height to first branch ellagic population stands 9-Sebiş-Moneasa (Figure 1). These populations belong to different harvesting areas, altitudes at which they grow are between 350-720 m, and the type of soil is eutricambosoil for all populations except 20-Anina population that grows on preluvosol.

Regarding the height of the crown observed that populations 5-Aleşd and 25-Bozovici their highest heights (Figure 2). To crown diameter highest values were recorded in populations 20-Anina, 25-Bozovici and 27-Huedin. These populations also belong to different harvesting areas, they increased between 280-720 m altitude, soil type being eutricambosoil for all populations except 20-Anina population that grows on preluvosol.

For total thickness of annual rings we find that populations 9-Sebiş-Moneasa, 20-Anina and 27-Huedin shows just above the average of the experiment (Figure 3). 9-Sebiş-Moneasa population belongs to the harvest area G 140 population belongs to 20-Anina harvest area F 340, and the population 27-Huedin area G 340, growing populations at medium altitudes of 500-700 m. As regards the type of it was different ground, namely20-Anina population increases preluvosol and populations 9-Sebiş-Moneasa and 27-Huedin on eutricambosoil.

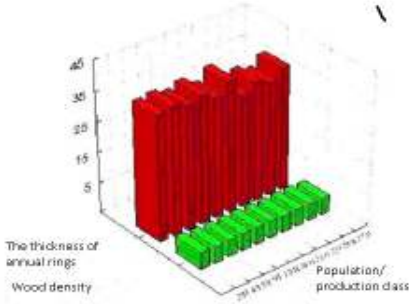


Figure 3. Variation of wood characters depending on the population studied in the age group 81-100 years

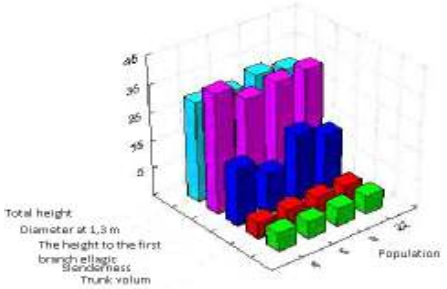


Figure 4. Variation in quantitative characters of the trunk on the population studied in the age group 81-100 years the production of class I

It was noted that the four populations of the same class production - I - 4-Marghita, 5-Aleşd, 9-Sebiş-Moneasa and 22-Caransebeş stands 9-Sebiş-Moneasa population (Figure 4) with a force growth and development of vegetation higher than in other populations (Figure 5), even if all populations vegetate at an average altitude on the same type of soil - and the same class productivity eutricambosoil resort - upper (Figure 6) (Ienciu , 2005).

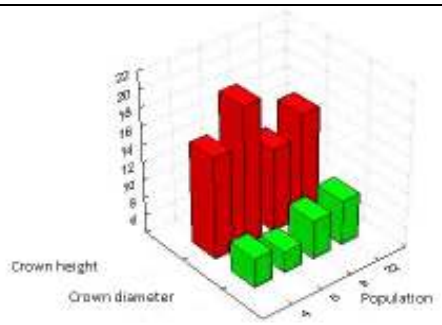


Figure 5. Variation characters crown on the population studied in the age group 81-100 years the production of class I

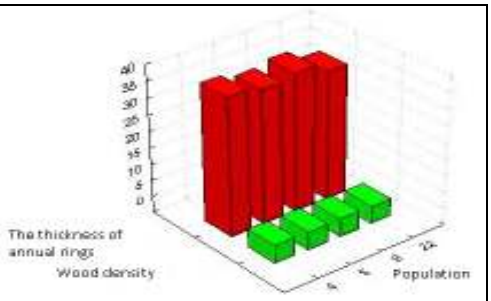


Figure 6. Variation of wood characters depending on the population studied in the age group 81-100 years the production of class I

Of the six populations of the same class production - II - 2- Sudrigiu, 17-Coşava, 20-Anina, 21-Teregova, 25-Bozovici and 27-Huedini stands population (Figure 7) with higher values quantitative characters and characters crown trunk (Figure 8), even if all populations vegetate at an average altitude on very different soil types, it growing on eutricambosoil (Figure 9).

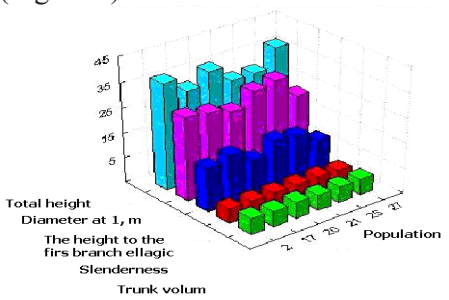


Figure 7. Variation in quantitative characters of the trunk on the population studied in the age group 81-100 years the production of class II

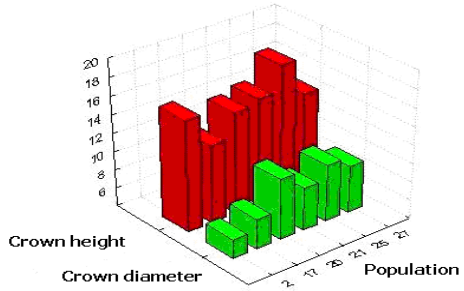


Figure 8. Variation characters crown on the population studied in the age group 81-100 years the production of class II

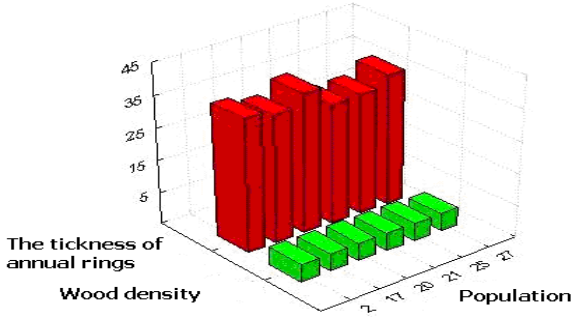


Figure 9. Variation of wood characters depending on the population studied in the age group 81-0 years the production of Class II

CONCLUSIONS

Changes interpopulational in all populations studied were very different from one character to another, by age and production classes, results allowing developing scientifically a strategy to be used in the breeding program phage vernacular, such phage presents a high degree of heterozygosity, especially in natural populations with their infinite amplitudes of genetic.

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