EVALUATION OF GENETIC DISTANCES FROM THE ORIGINS OF COMPARATIVE CULTURE BEECH ALEŞD-POIANA FLORILOR-BIHOR

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Abstract

The present researches resemble the tremendously plasticity and the high beech genetic diversity, a quite "young" species, so that is was born the idea that it is important to be established which beech origins are most indicated for extreme spas, which origins produce high quality wood, which have the best growth, have the highest frost resistance, which of them have the highest recreational and landscape value or any other social use.

Keywords: seedling plants, beech, survival, provenance, genetic distances

INTRODUCTION

One of the consequences of the most valuable populations represents the strategy plan of genetically resources utilization for export. It is known that in Romania exist centres of extremely valuable genes, with remarkable growing performances in different sides from Europe. In this way has creating the premises of reproduction forestry materials for enlarging of export with its. This way is available because these premises counting the environment's conservation and durable development principles al global level, which has promoted national strategies and a substantial growing of forest areas.

MATERIALS AND METHODS

In the comparative culture of descent installed at Aleşd, Poiana Florilor forest management unit, in the Bihor County, where the study material was composed of 31 descents of beech (*Fagus sylvatica* L.), representative for 17 European countries, from almost the entire natural area of the species, including Romania, the seedling plants used in the setting up of the culture were two years old and came from the nursery of the Institute of Forest Genetics in Schalembeck, Germany.

The culture's area of settlement was in the G2 zone – Apuseni Mountains, Pădurea Craiului Mountains, an area where climatic conditions are characterized by high humidity, and where because of warm climate is promoted a wider dissemination of mountain beech forests, subareas G 240-Beech hills - main area species: beech, altitude range 300-700 m while the experimental appliance for the culture was a 3x4 rectangular railing, with three repetitions, completely randomized, each unitary lot covering 10x10 m, and being made up of 50 plants placed on five rows with a 2 meter distancing in between and 1 meter distance within the row (Ienciu, Savatti, 2004).

For each analysed characters there were calculated the main statistical parameters: the medium, the standard deviation, minimum and maximum values, the amplitude variation, variance and variance coefficient (Ceapoiu,1968).The facts' analyse was performed after the STATISTICA program (Complet Statistical System, StatSoft, Inc., 1991). For the graphics' marking there were used computer graphic programs from STATISTICA and Excel.

The similarity or differences (distances) study between the tested origins, based on the results registered for more characters, was made through the "cluster" analyse, using the Euclidian distance from two points in the multidimensional space, determined by many vectors (characters), provided that there is no correlation between these (the determined position should not be influenced by covariance between the characters) (Lenfort-Buson, Vienne, 1985; Enescu, Cherecheş, Bândiu, 1997). For eliminating the results distortion, it was used the values standardization, which was carried out by replacing the gross value with the report between the difference from this value and the experience medium of the standard deviation.

The distance was calculated by using the formula: $d_{xy}= [\Sigma_i(x_i-y_i)^2]^{1/2}$, and the group was carried out with the "single linkage" method, where the distances between the groups are determined by the distance between the closest components (the closest neighbours) in the different types. This method is appropriate to the intented purpose and was preffered for other genetical distance types (Gregorius, 1984; Hazler, K. et al., 1997).

RESULTS AND DISCUSSION

There were calculated the Euclidian genetic distances, that allowed the contacts' establishment between the origins but also the group depending on the existing similarities (Konnert, 2000; Ienciu, 2007; Lazăr, 2008).

For survival, compared with Euclidean genetic distance, the resemblance is apparent links between the provenances studied, revealing two large groups of provenance (Fig. 1), and the first group tested the most part of provenances, having not a specific geographical location.

It is noted that the provenances from France has a different behaviour such as, three provenances were 1-Perche-France, 4-Southern Massif-France and 6-Plateaux du-France which are grouped together in the first group of provenances, while source 2 Bordure Man-France is part of the second group of provenances.

In addition, provenances from Austria are different group, namely 36-Eisenerz-Austria Provenance which is from the first group, while 35-Hinterstader-Austria Provenance is part of the second group. We may found the same thing may in Poland provenances, namely the first two 39-Jaworze 178 F-Poland, 40-Tarnava 81 C-Poland and 69-Sucha-Poland which are part of the first group of provenances and provenances 43-Jawornik 92 b-Poland and 67-Bilowo 115, 116-Poland are part of the second group of provenances.

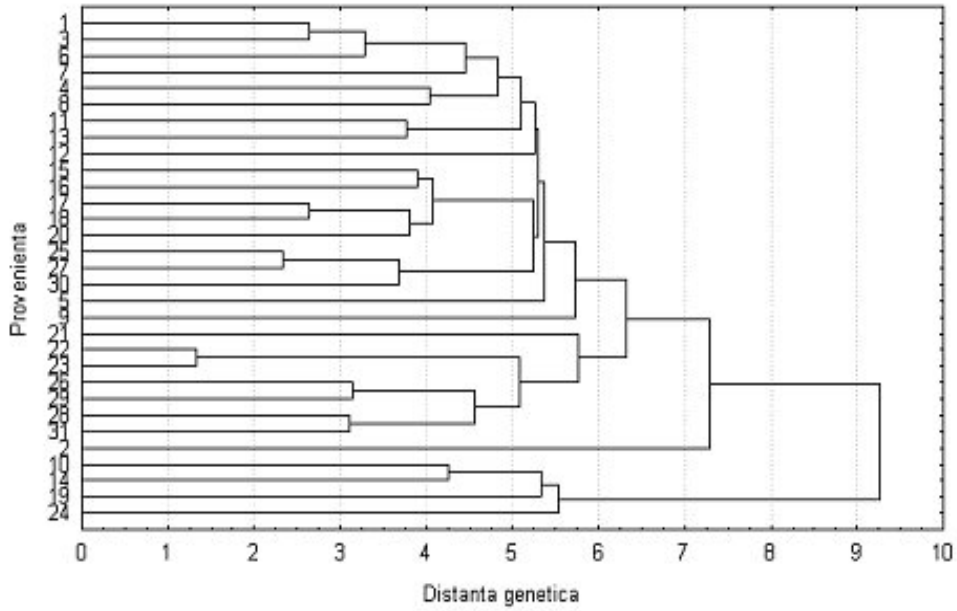

Fig.1. The Euclidian genetic distance of the beech origins depending on the survival in the comparative culture Aleşd-Poiana Florilor-Bihor

The four Czechoslovakia provenance are also part of different groups, namely origins 48-Jablonec N.N.- Czechoslovakia and 49-Brumov-Sidonie-Czechoslovakia which are part of the first group, and 51-Harn Plana-Ce-Czechoslovakia and 64-Nizbor-Czechoslovakia are from the second group. In the second group of provenances are three distinct subgroups. This group is composed mainly from Central and South-Eastern Europe provenances, the Romanian one 72-Bihor-Izbuc-Romania being part of the third subgroup.

It should also be noted that the origins that had the highest percentages of survival are grouped together in the first group of origins. After differentiation degree between populations was found that the highest degree of differentiation between the third subgroup provenances, the second group and first group of provenances.

After the total height the studied provenances are grouped into three major groups of provenances (Fig. 2).

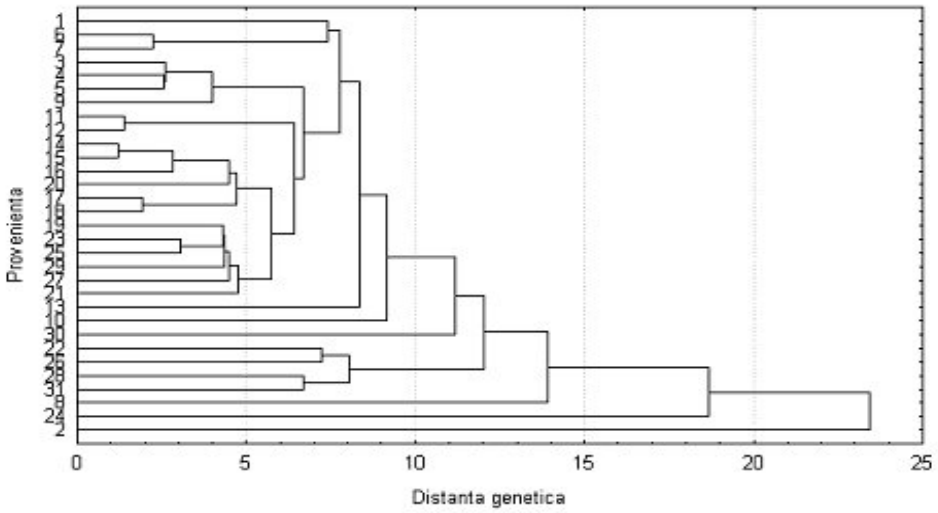

Fig. 2. The Euclidian genetic distance of the beech origins depending on the entire height of the comparative culture Aleşd-Poiana Florilor-Bihor

From the first group of provenances are taken part seven provenances from France, Luxembourg, Belgium, Netherlands and United Kingdom. Even in this situation the provenances from France were differently grouped, three of them being part of the first group, the provenance of 2-Bordure Man-France having part of the third group.

The same observation can be done about the two provenances from U.K., namely the 19-BE95 (4010)-U.K. provenance as part of the first group, while the 17-Westfield (2002)-U.K. provenance is part of the third group. The second group contains 14 provenances from Germany, Austria, Italy, Poland, Czechoslovakia, Hungary, Slovenia and Bulgaria.

Also, it is noted that the Polish provenances groups different, such four of them which are part of the second group, while 69-Sucha-Polish provenance is part of the third group. From the third group has part even a local origin 72-Bihor-Izbuc Romania. The provenances with the greatest heights (39-Jaworze 178 F-Poland and 37- Val di Sella-Italy), were grouped together, and form the second group of provenances.

The highest degree of differentiation between provenances was occurred between 2-Bordure Man.-France provenance and the rest of the provenances of the third group. After the basic diameter the provenances are grouped into four groups (Fig. 3).

With this character, the provenances from France belongs to the same group, namely the first group of provenances, more are coming from Luxembourg, Belgium, Netherlands and that two provenances from Great Britain. In the second group of provenances are coming from Sweden, Germany, Switzerland, Austria, Italy, Poland and Czechoslovakia.

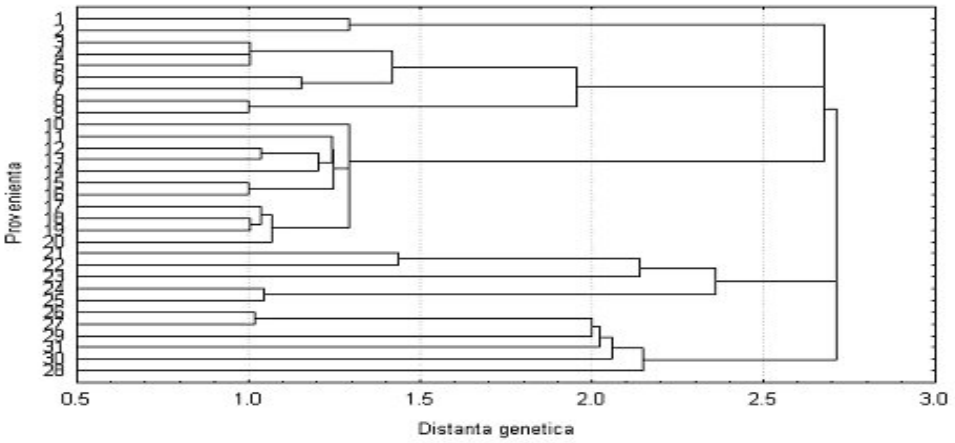

Fig. 3. The Euclidian genetic distances of the beech origins depending on the basic diameter of the comparative culture Aleşd-Poiana Florilor-Bihor

The Poland provenances were included also in different groups, namely the first three was part from the second grouping, while 67-Bilowo 115, 116-Poland and 69-Sucha-Poland are part of the forth group of provenances. Also, the Czechoslovakia provenances are group different, namely 48-Jablonec N.N.-Czechoslovakia provenance are part of the second group, and 49-Brumov-Sidonie-Czechoslovakia and 51-Harni Plana-Czechoslovakia provenances are from the third group of provenances. The third group of provenances is compose from South-Eastern Provenances, namely from Czechoslovakia, Hungary and Slovakia.

From the fourth group of provenances have also provenances from South-Eastern Europe, namely Bulgaria, Czechoslovakia, Poland and the population of Romania: 72-Bihor-Izbuc-Romania.

Among provenances that had the largest diameters, they are in the second group of provenances, except the provenance 67-Bilowo-115, 116-Poland, which belonged to the four groups of provenances.

In terms of differentiation between provenances, it is noted that between that four groups exist large divergent, the genetic structure of them could probably be very different.

CONCLUSIONS

By estimating the genetic distances between the beech origins there could be determined the similarities and differences between the populations, so it was resembled the level of similarity and divergence but also the behavior of the Romanian origins, which register a high level of differentiation comparing to the others. This represents an important aspect for selecting them in order to use these as reproductive forest material.

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