

Evaluating the progeny of European beech (*Fagus sylvatica* L.) in the early years of growth

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Abstract. This research was carried out on two experimental plots located in the Rymanów and Nawojowa forest districts. In the second and fifth year after planting, at three and six years of age respectively, survival and height of 25 beech progenies of selected seed stands were measured. Furthermore, we show the effect of beech origin and growth environment (significant ‘provenance × block’ and ‘provenance × test plot’ interactions). Beeches from both experimental plots differed significantly in growth and survival and this difference increased with tree age. The highest provenance heritability was obtained for the tree height after two years of growth in Rymanów. In Nawojowa, the heritability of beech survival reached zero after five years of growth. An evaluation of the stability of beech provenances (genotypes) in terms of survival and height under the habitat conditions of our experimental plots was done using the Finlay and Wilkinson method. The beech provenances of 469–Nawojowa and 452–Lesko (regional standard) were included as a stable basis for reference. A high degree of stability and high average values for the characteristics investigated indicate high progeny quality within these stands.

Keywords: testing program, survival, tree height, heritability, stability of genotypes

1. Introduction and study aims

The variability of individuals comprising the tree populations of forests is an essential condition for the effective selection of the most valuable provenances. It is the basis for the adaptability, stability and sustainability of forest ecosystems in the face of changing climates and environmental stress.

For a better understanding of the growth potential of specific populations of the most important forest species, we have been implementing ‘A programme of testing the progeny of selected seed stands, high quality trees, seed plantations and seed stand planting stock’ (Sabor et al. 2004) since 2004 in Poland. Knowledge of the breeding value of the progeny of each seed provenance, as well as an analysis of the interaction of adaptive traits to growing conditions is very important for proper forest management. Establishing plantations by using the offspring of the best seed sources growing in a particular region could provide progeny stands with good parameters of growth, quality and health. For each species in the testing

programme, the area of Poland was divided into test regions of the seed base. The four test regions established for the European beech are presented in Figure 1.

Poland’s first test plantations of beech were established in 2006 in region III (south-west) and region IV (south-east). Currently, there are 28 test plantations where beech progeny of randomly chosen trees from selected seed stands and parent trees are being tested, and this number is steadily increasing.

This study presents the results of an assessment of the adaptive traits of survival and height in the second and fifth years of age of European beech progeny from selected seed stands. The study was conducted in the south-eastern region of beech testing in experimental plantations located in the Rymanów and Nawojowa Forest Districts.

2. Materials and methods

The first test stand in the Rymanów Forest District was established in Lipowiec Forest Range (subdivision

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