Summary

Variability and breeding value of Norway spruce (Picea abies (L.) Karst.) of different provenances and families in the conditions of the Silesian Beskids

The common spruce in the Silesian and Żywiec Beskids is an important element of multifunctional forest stands and contribute to their biological diversity. Spruce stands, as a result of climate change, civilization expansion, mainly related to industrial development, and the impact of other negative biotic and abiotic factors, such as print bark beetle gradation, drought and wind, are still under threat. This is reflected in the significant decrease in the spruce seed base in the Beskidy forest districts in recent years. Therefore, it is necessary to pay close attention to the course of phenomena occurring in these stands, in order to prevent the large scale restart of destructive processes. The ongoing reconstruction of spruce monocultures and increasing the share of fir and beech in the species composition, also implies a significant share of spruce in the composition of stands in the Silesian Beskid and Żywiec Beskid. Threfore, there is a need to evaluate the progeny of the seed base, seed stands and mother trees of spruce, in terms of their genetic value and breeding suitability to changing growth conditions.

The purpose of the study is to identify the valuable seed base of Norway spruce with high production and quality potential, to identify the most valuable origins and pedigrees for cultivation in the habitat conditions of the Silesian Beskids, to determinate the population for further use in selection.

The work includes an analysis of the variability of adaptive, growth and phenological traits in the progeny of 45 stands and 42 mother trees of Norway spruce protected in the Carpathian Gene Bank. The study evaluated survival, total height, breast height, cross- sectional area and spring shoot, as well as the breeding value of spruce descendants and pedigrees growing on the plots of the provenances and families archive in the Wisla Forest District.

On the basis of research on the variability of common spruce from the Silesian Beskid and the Zywiec Beskid in the plots of the in situ provenances and families archive at the Carpathian Gene Bank in the Wisla Forest Dictrict, the research hypothesis was confirmed, that the provenances and families of Norway spruce in the local habitat conditions of the Silesian Beskid differ in terms of 1) adaptability, growth, quality and phenological development in spring; 2) course and dynamics of the studied traits (effect of genotype x age interaction); 3) estimated heritability and stability for selected traits, and 4) breeding value assessment.

Reconstruction of spruce stands assumes a significant share of common spruce in their species composition. Therefore, it is worth using the results of experiments and supporting provenances or pedigrees verified in progeny tests. The decay of Istebna spruce stands has resulted in a reduction of the existing base of forest basic material (FBM). Studies testing the progeny of stands from Wisla Forest District, will be helpful in selecting a new qualified and selected seed base.

The results will allow the selection of population whose breeding value distinguishes them from other origins and lineages. The in vivo pool of forest gene resources of Norway spruce also remains in the archives, which will help maintain the diversity of Polish forests.

Keywords: Norway spruce provenances, Norway spruce families, Carpathian Gene Bank, phenology, heritability, variability, Wisla Forest District