Summary

Tree growth in a stand depends on a number of factors: age, size, microhabitat, genetic characteristics and competition. Growth and competition are among the processes in the stand that influence the formation of spatial structure.

The aim of the above study was to determine the effect of competition on the 10-year volume increment of Scots pine and Norway spruce by means of competition indices and additional explanatory variables, i.e. age, tree breast height, tree volume, boning index or climatic indices. In addition, a spatial analysis of the accuracy of the model used at the level of natural forest regions was carried out for Scots pine.

Competition was described by 26 distance-dependent competition indices and 7 distance-independent competition indices, which were calculated in two variants of determining the zone of influence. The selection of competition trees was based on the inverted cone method, with a 60° dilation angle based on 0.6 and 0.1 of the height of the respective tree.

Each of the species presented showed a different level of explanation of the variation in volume increment by competition. For Scots pine, the highest level of coefficient of determination was achieved by the model based on competition index CI_{27} (53.9%). For Norway spruce, the highest level of coefficient of determination was achieved by a model also based on competition index CI_{27} (72.1%). The best model for spruce is based on a set of variables, i.e. site index (SI), tree breast height diameter (d_{1.3}) and CI_{31} , where the coefficient of determination is 80.2%, with a standard error of 0.117 m³ in determining the volume increment. For pine, on the other hand, it is a model also based on the site index (SI), tree breast height diameter (d_{1.3}) and competition index CI_{27} , where the coefficient of determination is 69.1%, with a standard error of determining the 10-year volume increment of 0.076 m3.

The level of explanation of the variation in increment is higher in lands I and II, and VI,VII and VIII, for the competition index CI_{22} in the second variant of determining the zone of influence. At the same time, the highest determination index was achieved in the VIII natural-forestry land (68.6%).

The use of the presented set of competition indices, both spatially dependent and independent, allows the selection of indices that most accurately describe the competition between trees under the given conditions for a given tree species.

In the context of the research presented here, it is not possible to select a universal competition index, or a group of indices clearly superior to others, the indices perform

differently depending on species and growth conditions and a better understanding of how competition can be measured and how it affects the growth of individual trees is essential for predicting stand development.

Key words: competition index, volume increment, Scots pine, Norway spruce