

Genetic variation of black poplar (*Populus nigra* L.) in Poland: the impact of human activities on genetic integrity and adaptive potential of the species

Great river valleys are extremely diverse and productive ecosystems. For this reason, they have been subjected to human activities since prehistory, which led to strong transformations that eventually resulted in significant biological impoverishment of these areas. Willow-poplar riparian forests, once widespread, are now rarely encountered. One of the main species that forms such communities is black poplar, which is considered endangered in many European countries. In Poland, the present state of this tree is poorly understood. Black poplar is of great ecological and economic value. The habitats in which it occurs constitute natural flood protection and are considered biodiversity centers, being part of the Natura 2000 network as areas of particular importance for the preservation of Europe's natural heritage.

During recent decades the population size of black poplar has decreased dramatically due to the progression of urbanization, river regulation and transformation of natural floodplains for agricultural and forest usage. Our field observations have shown that many black poplar populations in Poland are in terminal age classes. Poplar seeds retain their ability to germinate only for a very short period of time and need a suitable place and specific environmental conditions – a place that is lacking, especially in heavily transformed regions, such as the Odra and Warta valleys, as well as the upper and lower Vistula. The gene pool of black poplar is also threatened by the inflow of foreign genes from widely cultivated, fast-growing hybrids of poplars that were planted in river valleys on a large scale between the 1950s-1970s. Therefore, conservation programs for the protection of black poplar's genetic resources should be developed. For this purpose, however, the available knowledge of the genetic variability of black poplar in Poland, which so far is very limited, should be significantly expanded.

The main goal of the project is to describe the genetic variation of black poplar in Poland with the use of modern molecular techniques, i.e. various types of numerous genetic markers. Eighteen previously selected populations of the species, growing in the valleys of the main rivers in Poland, will be examined in the course of the project. The planned analyses will cover about 1,000 adult individuals and young trees from natural regeneration of the species, as well as seedlings grown from seeds in the case of areas where black poplar is unable to reproduce due to the lack of suitable habitats. The research will also incorporate black poplar representatives from other European and African countries, as well as hybrid varieties that will serve as reference samples.

The results of the project will make it possible to comprehensively characterize the genetic resources of black poplar in Poland, as well as to assess the abundance, viability and reproductive capacity of this species. We will evaluate the usefulness of new genetic markers for the development of conservation programs. We will also assess the threat to the genetic purity of black poplar which is posed by hybrid trees. The planned research will be important from the point of ongoing climate changes, because it will make it possible to determine how individual populations will react to these changes by assessing their adaptive potential. The final outcome of the project will be the conservation strategy of the genetic resources of black poplar, which will be reported to the authorities responsible for nature protection in Poland.