

River valleys in Europe have been subject to strong anthropopressure for centuries. It is mainly related to flow regulation, water pollution, development of agriculture and buildings, as well as recreational activities. The beds of the majority of the European rivers were regulated, and thus lost their natural character. Additionally, levees are created along the river beds. Therefore, floods which were typical of river valleys became rather rare nowadays. Nevertheless, river valleys still constitute important migration corridors for various groups of plants and animals. They are also still recognized as regional biodiversity hotspots. In Central Europe, a number of vascular plant species grow mainly or exclusively in valleys of large rivers. They are termed as river corridor plants. Despite the phenomenon whereby some plant species display a river corridor distribution pattern has been observed by botanists from the second half of the nineteenth century and many hypotheses regarding the phenomenon have been proposed, no exhaustive explanation has yet been put forward. Understanding mechanisms generating this unique distributional pattern seems to be one of the main challenges facing plant geographers and ecologists.

The aim of the project proposed for financing is a detailed analysis of the importance of soil microorganisms and the physicochemical properties of soils for shaping the river corridor plant distribution pattern. The project includes both analyses based on soil and plant samples collected in valleys of the three large rivers (San River Valley, Vistula River Valley and Oder River Valley) as well as experimental research. During project implementation, association between the mycorrhiza development in species representing river corridor plant group and widespread species (not confined to the valleys of large rivers) and the structure of soil microorganism communities as well as the physicochemical properties of soils in sites located at different distances from the river beds will be determined. A pot experiment will be conducted to assess the impact of soil microorganisms and soil physicochemical properties on species representing river corridor plant group and widespread species. Photosynthesis parameters, biomass production as well as the content of selected elements in the biomass of plants cultivated on different types of soil will be analyzed.

We expect that river corridor species are not dependent on arbuscular mycorrhiza as much as widespread species. Consequently, river corridor species growing at different distances from the river will be characterized by a similar degree of mycorrhizal development (regardless of differences in the microbiological properties of soils), while widespread species will have better mycorrhiza developed in sites distant from the river, which are characterized by more stable microbial communities than sites adjacent to the river bed. Since it is generally accepted that soil pH is one of the most important edaphic factors shaping soil microbial communities, and this soil parameter also seems to be important for river corridor plant occurrence, we assume that the occurrence of river corridor plants is associated with a specific structure of soil microbial communities. We assume that widespread species get more benefits from the possibility of coexisting with arbuscular mycorrhizal fungi than river corridor plants. This is why biomass production, photosynthesis parameters and the content of the elements in the biomass in the case of specimens representing widespread species will be similar both when sandy soil (nutrient-poor but rich in arbuscular mycorrhizal fungi) and loamy alluvial soil (nutrient-rich but poor in arbuscular mycorrhizal fungi) will be used for cultivation. Whereas, the mentioned parameters will be significantly higher in the case of specimens of river corridor plants cultivated on alluvial soils than in the case of specimens cultivated on sandy soils.

Understanding factors determining the river corridor plant distribution pattern is very important, especially in the nature conservation context. It's because many river corridor species are considered to be endangered – not only in Poland but also in Europe. In addition, the results obtained during project implementation will be useful in planning (recently popular in the European Union) initiatives aimed at protecting valuable river valley ecosystems or restoring degraded ones.