## Barcoding and assessment of genetic variability of rare species of Ukrainian flora

## 01.01.2021-31.12.2023

## Project authors: R.A. Volkov, I.I. Panchuk

Mass extinction of plants and animals and decline in biodiversity are global problems. The development of an effective strategy for the protection of biodiversity and the rational management of biological resources are impossible without the accurate identification of species and the assessment of genetic polymorphism at the inter- and intraspecific levels. Nowadays, these problems are successfully solved by molecular barcoding.

In the project, sequencing of selected regions of chloroplast (*trnT-L*, *trnL-F*, *trnS-G*, *trnH-psbA*) and nuclear (ITS1-ITS2 and 5S rDNA) genomes, bioinformatic databases screening and determination of species affiliation using barcoding were applied for clarification of taxonomic position and assessment of genetic diversity in 45 rare plant species of Ukrainian flora, which belong to the genera *Aconitum, Lathyrus, Limonium/Goniolimon, Muscari* and *Tulipa*.

Comparison of the DNA sequences of *Aconitum eulophum*, *A. jacquinii* and *A. pseudanthora* showed that these species are very similar to each other and should be considered as a single taxon within the complex species *A. anthora* s. l. The data indicate that the Ukrainian samples of *A. anthora* s. l. should be treated as a new species that requires protection and further studies.

Using SRAP markers, low genetic diversity was found in the populations of three endangered *Lathyrus* species of the Ukrainian flora, *L. laevigatus, L. transsilvanicus* and *L. venetus*, which may be one of the reasons for their extinction. The hypothesis about hybridization between *L. vernus* and *L. venetus*, which may lead to the disappearance of *L. venetus* in natural populations, was confirmed. Due to its genetic uniqueness, *L. transsilvanicus* needs additional protection.

Phylogenetic analyses showed a significant difference between Ukrainian samples of *Muscari botryoides* and samples of this species from other habitats, as well as other species of the genus *Muscari*. This allows to consider the Ukrainian samples of *M. botryoides* as a new, previously undescribed species.

Given the high sequences similarity between the representatives of the genera *Goniolimon* and *Limonium* of the Ukrainian flora, *G. orae-syvashicae, G. tauricum, L. caspium* and *L. tschurjukiense* should be considered as synonyms of *G. rubellum, G. tataricum, L. bellidifolium* and *L. tomentellum* respectively. The evolution of the genomes in the genus *Limonium* had a reticulated character due to interspecific hybridization.

The obtained data show that the species names *Tulipa graniticola, T. hypanica, T. ophiophylla, T. scythica* and *T. quercetorum* listed in the Red Book of Ukraine should be considered synonymous. At the same time, collectively, all these specimens from Ukraine form a separate taxonomic group, which should be treated as a new species within the species complex of *T. sylvestris* s. 1. This unique species needs additional study and enhanced protection.

The obtained results confirm the genetic uniqueness of the studied samples of the Ukrainian flora and should be taken into account when developing a strategy of their protection.