

DESCRIPTION FOR THE GENERAL PUBLIC

Reasons for choosing the research topic

Nowadays, more and more species appear on the brink of extinction, their habitats disappear as a result of human activity, what is more - often each individuals are destroyed or killed. As a result, many species in nature limits its occurrence to small, isolated populations, where related individuals must breed with each other and it can lead to inbreeding depression - a decline of genetic diversity, which is the result of inbreeding, and which results in reduced adaptation of the specimens. Recent studies indicate an important role of epigenetic processes (modifications of the DNA and associated proteins - modifications that do not alter the genetic information, but there may change the way of it's reading) in the phenomenon of inbreeding depression. Until now there was proven that the change of the methylation of DNA may delete the phenotypic symptoms of depression, and that epigenetic changes occur due to various environmental factors. On the other hand, we have not yet know much about possible patterns of response to stress and about differences in epigenetic modifications between individuals from inbred and open populations. Such knowledge could be very useful, first - to the deeper knowledge of epigenetic mechanisms, and what's more, it could be applied:

- 1) in the nature conservation - to save rare and endangered species;
- 2) in the economy - to strengthen the valuable but genetically poor or homogeneous varieties and breeds of plants and animals.

The species that will be objects of research are closely related plants: *Festuca amethystina* and *Festuca tatrae* (family *Poaceae* - grasses). Both species have isolated and open populations. Yet unpublished study carried out by Department of Geobotany and Plant Ecology (University of Lodz) about phylogeography of *Festuca amethystina* indicate that indeed this species has a distinctly different level of differentiation of populations: low-diverse isolated populations and more diverse open populations. Moreover it is worth to say that *Festuca amethystina* is a species which developed from *Festuca tatrae*. But only *Festuca amethystina* spread over a larger area - in relation to the ancestral species it reached major ecological success. Comparing these species may help us better understand the causes of greater adaptability of certain species. What's more - because they are grasses, such as cereals, exploration mechanisms of adapting of plants from this family might be beneficial in economy.

The objective of the Project

This project is an attempt to find links between observable symptoms of inbreeding depression, the level of epigenetic modifications and genetic diversity - whether and what epigenetic differences in stress responses occur in individuals from isolated and open populations. It will be compared both types of population for: *Festuca tatrae* and both cytotypes (diploid and tetraploid) of *Festuca amethystina*. This will provide additional information: about the differences in epigenetic response to stress between closely related species with different adaptability and between different cytotypes of the same species.

The project moreover will contribute to better describe the genetic structure of two endangered species (especially *F. tatrae* - it is on the world IUCN list of threatened species). This will allow to better plan it's protection

The research which will be carried out

The project involves 3 groups of research (all for *Festuca amethystina* and *Festuca tatrae*; for isolated (inbred) and open populations):

- 1) genetic research: analysis of microsatellite loci, which will provide more information about their genetic diversity and the level of inbreeding;
- 3) epigenetic research: examination the level of DNA methylation during favorable conditions and during stress conditions (relatif drought);
- 2) biometric research - measurement and analysis of selected physical parameters of plants - phenotypic evaluation of inbreeding depression.