Project 1: Authentication and Quality Control of Gene Bank for Crop Wild Relatives

Each gene bank is only as good as the samples in this gene bank are authentic (i.e. are in reality, what they are supposed to be). Although this may sound trivial, it is not. An estimated >10 % of samples in gene banks and germplams collections are estimated to be mislabelled or misdetermined in a worldwide average. Especially species with a strong tendency towards hybridisation or species that rarely flower are hard to be determined taxonomically and therefore are prone to errors. Our German Gene Bank for Crop Wild Relatives is not exempt from this problem. The accessions have been collected during seed maturation, which means that flowers as most relevant taxonomic trait are absent. At this stage, even experienced taxonomists have problems to assign a species without errors. Most determination keys are referring to flower traits, because these are most independent from the environment and therefore are constant.

To safeguard the quality of our Gene Bank for Crop Wild Relatives, we are therefore continuously assessing quality, which means that in addition to authenticity, we are testing viability and germination rate for our accessions. This gene bank was established some years ago in a joint network of four Botanical Gardens that collected a list of several hundreds of wild species all over Germany. We were in charge of the Southwest of Germany. The resulting collection has been assembled in the seed bank of the Botanical Garden in Osnabrück and is part of the National Plan for Plant Genetic Resources. While the first years were dealing with establishing and registering this collection, we are currently in the next phase, where this biodiversity is characterised with respect to potential applications. Here, quality and identity of the samples is vital, because otherwise research will go astray and lead to nothing.

Objectives: In a project funded by the BMBF, genetic resources of Wild Strawberry (*Fragaria vesca*) are explored in the context of improving cold tolerance of Cultivated Strawberry (*Fragaria x ananassa*) and its ancestors, the North American *F. virginiana* and the South American *F. chiloensis*.

Approach: Seed samples for cultivated strawberry varieties, the two ancestral species and a collection of wild strawberries from different regions and ecosystems within Germany have to be checked for quality and authenticity. In a first step, aliquots of seeds are investigated microscopically for morphology and authenticity based on taxonomical literature and databases (see below). In addition, high-quality three-dimensional images should be produced, showing details of seed surface along with surveys of the entire seed. This will be done with a special Keyence digital microscope in the Imaging Center (Biologieturm, 4th floor). These digital images will later be assembled into a digital seed atlas of our gene bank. The list of accessions are given in the appendix.

Note: The seed samples are handed out in the Botanical Garden by Herr Daumann (joachim.daumann@kit.edu) or Frau Kuppinger (anna-luisa.kuppinger@kit.edu) and have to be handed over after the end of the project. By no means sort in the samples yourself in the CWR Gene Bank! Reason: if a sample is mis-sorted, it is lost, because we will never be able to find it again.

Information Resources:

Image collections for seeds

- Dutch Digitale Zagenatlas http://seeds.eldoc.ub.rug.nl/?pSearch=ON
- Kew Garden http://data.kew.org/sid/sidsearch.html
- Seed Place http://theseedsite.co.uk/seedpods.html

On the German Crop Wild Relative Gene Bank project: http://www.botanik.kit.edu/garten/97.php

On the FRAGANANAS Project: http://www.botanik.kit.edu/garten/848.php