The role of genetic diversity in crops and their ancestors for future food security

Prof. Karl Schmid, University of Hohenheim

The population growth and activities of humans leave a strong footprint on the global climate and future conditions for agriculture. To ensure sufficient yields crops have to be adapted to a rapidly changing environment that likely consists of multiple interacting stresses such as high CO_2 content, low water and high temperatures. Traditionally, landraces were found to show a good yield stability under variable conditions but they produce less yield than modern elite varieties cultivated under optimal conditions. One central goal of future plant breeding is to combine high yields with yield stability, and the use of exotic germplasm (plant genetic resources) is frequently proposed to achieve this goal. National and international genebanks harbor millions of samples of exotic varieties, and there are now several initiatives to systematically characterize and utilize this diversity. We explore this approach with wild barley *Hordeum spontaneum*, the ancestor of our cultivated barley because it shows adaptation to very different environments along environmental gradients in Israel. Using population genetic analyses and transcriptome sequencing coupled with stress treatments, we identified differentially adapted genotypes and numerous genes affected by the stress. We will use further approaches like backcrosses and quantitative genetics to identify the genetic basis of the adaptation and to introgress useful genetic variation into modern varieties.