

Evaluation of Ethiopian barley landraces for drought stress tolerance

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Drought is the main limiting factor for yield losses in Ethiopia. Barley (*Hordeum vulgare* L.) is the best adapted cereal crop in Ethiopia which is grown from drought-prone areas of an altitude of 1500 meter above sea level up to the highlands of Ethiopia (3400 m) which are characterized by a temperate climate with adequate rainfall. Thus, barley landraces from Ethiopia may be a valuable source to exploit drought stress tolerance. To achieve this, field experiments including 260 Ethiopian barley landraces were conducted in two cropping seasons in Ethiopia (2016 and 2017) at two locations with natural drought stress (Melkassa and Dera) and two locations having adequate moisture conditions (Holetta and Debre Zeit). Additionally, landraces were genotyped with the 50k iSelect chip to identify genomic regions involved in drought stress tolerance by genome wide association studies (GWAS).

The cropping data of 2017 was omitted from further analysis due to the presence of adequate rainfall in drought stress locations. Analysis of variances (ANOVA)

revealed significant ($p < 0.001$) differences between control and drought stress conditions for total grain yield in 2016. Furthermore, significant ($p < 0.001$) effects between the landraces were observed, representing high genotypic variation. Total grain yield at drought stress conditions (Y_s) was significantly ($p < 0.001$) correlated with days to flowering ($r = -0.68$) and maturity ($r = -0.42$)

Drought indices like stress tolerance index (STI) and stress non-stress production index (SNPI) were used to cluster the landraces, by tolerance to drought stress. Thus, e.g. landraces B191.1 and B222 were clustered as best performing ones under drought stress.

One year field experiments revealed genotypic variation in Ethiopian barley landraces. In a next step, genome wide association studies will be conducted in order to identify genomic regions involved in drought stress tolerance and to develop molecular markers suited to be used in future barley breeding.