Variability of drought stress responses among barley genotypes

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Drought is one of the most important factors for crop losses in agriculture. Drought stress is defined as an insufficient availability of water that is increased during higher temperatures (Matiu et al., 2017), which could lead to crop yield losses about 25-40 % (Daryanto et al., 2017). In addition, drought-stressed plants have an increased susceptibility to pathogens because of the reduced defense of the plant (Liu et al., 2016). Recently, plant strengthening agents and biostimulants based on organic and inorganic materials or microorganisms have been reported to enhance the health of plants and their tolerance to abiotic stress (du Jardin et al., 2020). For example, the extract of *Fallopia sachalinesis* (Milsana®) possesses a plant-strengthening and infection-reducing impact on *Blumeria graminis* (Konstantinidou-Doltsinis et al., 2017). Therefore, we aim to investigate the drought stress tolerance (JKI, Quedlinburg), reported here, and the resistance against *Blumeria graminis* infection (JKI, Darmstadt) in barley in response to the treatment of the plants with various biostimulants. First, we selected 50 contrasting genotypes from the Genobar collection (Pasam et al., 2012) by the relation of ear type, origin, known drought stress tolerance, and genetic diversity. These 50 genotypes were grown in the greenhouse under either drought stress or well-watered conditions in juvenile stages. The characterization of drought stress tolerant and susceptible genotypes is performed by a determined definition of drought stress parameters.

First regulatory mechanisms of water-limitation are stomatal closure and decreased photosynthetic activity to reduced transpiration (Ali et al., 2017). Also, physiological characteristics such as “stay-green” parameters (chlorophyll content and –fluorescence) are important for the determination of drought stress tolerance (Gepstein & Glick, 2013). Additionally, parameters like high water use efficiency (WUE) and high content of osmolytes indicate drought adaptation of barley genotypes. Quantitative parameters in late developmental stages are as well affected by early drought stress, usually leading to yield losses (Hafid et al., 1998). Therefore, we also determined yield traits like biomass, tiller number, grains/ear, thousand-grain weight, and grain yield/plant.

On our poster we will summarize the results from this drought stress experiment and discuss the differential responses among the 50 barley genotypes.

Based on these results, we selected ten contrasting genotypes for further examinations in greenhouse trials and under field conditions in rainout-shelter facilities. In these experiments, we will test the impact of plant strengthening agents and biostimulants on these ten selected genotypes in regard to their response on drought stress and infection with *Blumeria graminis*.