Session E

Drought stress response of barley genotypes treated with biologicals

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This year, almost 50% of the European agricultural area suffered from drought stress. The tendency for the next years is constantly increasing. Therefore, plants develop different strategies to adapt to drought stress like in morphological, physiological and molecular pathways. In addition to drought stress, there are other challenges to handle with like the decrease of conventional plant protection products due to their negative ecological consequences. Thus, biologicals are gaining more importance because of their environment-friendly property. Biologicals are products containing natural substances and/or microorganisms leading to increasing abiotic and biotic stress tolerance. The aim of this study is to investigate drought stress tolerance in various barley genotypes (*Hordeum vulgare* L) and to analyse the effect of application of biologicals on these genotypes under drought stress.

First, eleven diverse reacting genotypes were selected out of 200 accessions from the spring barley IPK-SB224 panel (Genobar) for greenhouse and field experiments. Drought stress was induced by 20% water capacity at the third-leaf stage for six weeks followed by a two weeks re-watering phase to investigate the recovery ability with and without treatment of biologicals. During drought stress and re-watering phase, chlorophyll content and stomatal conductance were measured and water use efficiency was calculated for this period. Flag leaves were collected to examine the osmolality, proline content and soluble sugars as well as for qRT-PCR analysis of several relevant drought stress genes. Moreover, mature plants were harvested and yield parameters like kernel biomass were acquired. Additionally, root morphology of the eleven genotypes was analysed in a hydroponic system by application of PEG6000 as an osmotic stressor.

First results indicate a high significant ($p<0.01$) correlation of plant and kernel biomass between greenhouse and filed experiment of 0.6 and 0.54, respectively. Most significant correlation with the plant biomass was calculated for water use efficiency (0.93) and water use (0.72) under greenhouse conditions. Preliminary results of the analysis of biologicals under drought stress treatment show an increase in biomass up to 78% by applying extract of *Arcitum lappa* and 130% by the extract of *Reynoutria sachalinensis*. Results of the root analyses indicate that all root related parameters such as root biomass, length and volume are significantly ($p<0.001$) affected by PEG treatment and genotype.

Next steps are to verify the results of drought adaptation under biological treatments in a greenhouse experiment and in field experiments in 2023.