

Drought stress during anthesis alters grain protein composition and Improves Bread Quality in Field-Grown Iranian and German Wheat Genotypes

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Drought stress is playing an increasingly important role in crop production due to climate change. To investigate the effects of drought stress on protein quantity and quality of wheat, two Iranian (Alvand, Mihan) and four German (Impression, Discus, Rumor, Hybery) winter wheat genotypes, representing different quality classes and grain protein levels, were grown under field conditions in Eqid (Iran) during the 2018–2019 growing season. Drought stress was initiated by interrupting field irrigation during the anthesis phase at two different stress levels. Drought stress at anthesis did not significantly change total grain protein concentration in any of the wheat genotypes. Similarly, concentrations of grain storage protein sub-fractions of albumin/globulin, gliadin and glutenin were unaltered in five of the six genotypes. However, analysis of protein sub-fractions by SDS polyacrylamide gel electrophoresis revealed a consistent significant increase in ω -gliadins with increasing drought stress. Higher levels of HMW glutenins and a reduction in LMW-C glutenins were observed exclusively under severe drought stress in German genotypes. The drought-induced compositional change correlated positively with the specific bread volume, and was mainly associated with an increase in ω -gliadins and with a slight increase in HMW glutenins. Despite the generally lower HMW glutenin concentrations of the Iranian genotypes and no effect of drought on the concentration of HMW sub-fraction, there was still high specific bread volume under drought. It is suggested that for the development of new wheat cultivars adapted to these challenging climatic conditions, the protein composition should be considered in addition to the yield and grain protein concentration.

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