Genetic diversity as a paramount factor determining wheat adaptation to drought stress

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Abstract

Wheat (*Triticum aestivum* L.) is a globally important crop for food and nutritional security that requires sufficient water supply for optimal production. All stages of wheat growth and development are adversely affected by reduced water supply, which limit productivity across large areas of Central and Southern Europe. Since drought episodes are expected to occur more frequently and with a greater intensity, the research efforts are devoted to identification of key traits associated with drought resistance that could be used as direct and indirect selection criteria for wheat drought tolerance. We evaluated and quantified several key genetic and molecular features of wheat genotypes with contrasting drought tolerance under severe dehydration triggered by the treatment of wheat with 250 mM sorbitol in hydroponic systems. Plant status was evaluated non-destructively by measuring leaf chlorophyll index, nitrogen content, and leaf relative water content. The drought-tolerant genotype displayed higher chlorophyll and nitrogen content, when grown under drought and benign conditions. Since root architecture appears to be a key trait for breeding against dehydration, we analysed the members of the *DEEPER ROOTING* (*DRO*) gene family that allow the root to penetrate deeper into soil, which could increase the yield even upon water shortage. Expression patterns of the *DRO* members showed genotype-specific changes under drought stress, which correlated well with plant drought tolerance. Our experiments suggest that genes affecting root system architecture could contribute to development of wheat cultivars with higher drought adaptability.

Keywords

wheat cultivars, drought resistance, root traits, *DRO* gene family

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Presented at

International Conference on DNA Barcoding and Biodiversity (ICDBB)

Acknowledgements

This work has been carried out in the framework of the National Science Program "Environmental Protection and Reduction of Risks of Adverse Events and Natural Disasters", approved by the Resolution of the Council of Ministers № 577/17.08.2018 and supported by the Ministry of Education and Science (MES) of Bulgaria (Agreement № Д01-363/17.12.2020).

Hosting institution

Institute of Plant Physiology and Genetics, Bulgarian Academy of Sciences

Conflicts of interest