Posted on Authorea 30 Mar 2022 — The copyright holder is the author/funder. All rights reserved. No reuse without permission. — https://doi.org/10.22541/au.164864945.52920985/v1 — This a preprint and has not been peer reviewed. Data may be preliminary.

Breeding driven enrichment of genetic variation for key yield components and grain starch content under drought stress in winter wheat

Patrice Koua[1], Benedict Oyiga[2], Jens Léon[2], and Agim Ballvora[1]

[1]Rheinische Friedrich-Wilhelms-Universitat Bonn
[2]Rheinische Friedrich Wilhelms Universitat Bonn Institut fur Nutzpflanzenwissenschaften und Ressourcenschutz

March 30, 2022

Abstract

Drought is one of the major abiotic stress factors limiting wheat production worldwide, thus threatening food security. The dissection of the genetic footprint of drought stress response offers strong opportunities toward understanding and improving drought tolerance in wheat. In this study, we investigated the genotypic variability for drought response among 200 diverse wheat cultivars (genotypes) using agronomic, developmental, and grain quality traits, and conducted genome-wide association studies (GWAS) to uncover the genetic architectures of these important traits. Results indicated significant effects of genotype, water regime and their interactions for all agronomic traits. Grain yield was the most drought-responsive trait and was highly correlated with kernels number per meter square. GWAS revealed 17 and 20 QTL regions under rainfed and drought conditions, respectively, and identified one LD block on chromosome 3A and two others on 5D associated with breeding progress. The major haplotypes of these LD blocks have been positively selected through breeding and are associated with higher starch accumulation and grain yield under drought conditions. Upon validation, the identified QTL regions caring favorable alleles for high starch and yield will shed light on mechanisms of tolerance to drought and can be used to develop drought resistant cultivars.

Hosted file

`Main Document.pdf` available at https://authorea.com/users/411921/articles/562693-breeding-driven-enrichment-of-genetic-variation-for-key-yield-components-and-grain-starch-content-under-drought-stress-in-winter-wheat

Hosted file

`FIGURES.docx` available at https://authorea.com/users/411921/articles/562693-breeding-driven-enrichment-of-genetic-variation-for-key-yield-components-and-grain-starch-content-under-drought-stress-in-winter-wheat