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"Competing pathways for equitable food systems transformation: Trade-offs and synergies"

Wheat rhizosphere bacteriome to heat stress for developing resilient wheat cultivars to sustain food security

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Abstract

Heat stress is a significant abiotic stress that affects wheat crop productivity worldwide leading to potential risks under food security in the next decades promoted by climate change. In recent years, research has focused on understanding the mechanisms by which rhizosphere bacteria enhance plant adaptation to heat stress. Bacteria act with plants synergistically to play an essential role in plant growth, development, and adaptation to heat stress. While understanding of how the plant microbiome is shaped is steadily increasing, only a modest number of studies have explored the composition of the rhizosphere bacteriome of wheat-tolerant to heat stress events and its contribution to plant resilience. To address this issue, we analysed the functional composition of the rhizosphere bacteriome to four contrasting wheat genotypes under heat stress in two crop cycles at the CIMMYT CENEB experimental research centre and breeding station in the Sonora desert of Mexico. Total DNA was isolated from Rhizospheric soils (0–30 cm depth) collected from two field trials on heading + 12 days and heading + 10 days growth stages respectively, and the rDNA 16S V4 hypervariable region was sequenced employing next-generation sequencing technologies based on Illumina (MiSeq and Rapid Mode Hiseq). This approach of understanding the diversity, composition, and functional properties of the rhizosphere bacteriome will help as a baseline to understand the molecular mechanisms underlying the plant-bacteria interactions that promote genotype adaptation to heat stress events. The results of this research would allow the potential use of wheat rhizosphere bacteria for enhancing plant adaptation to heat stress and developing resilient wheat cultivars for adaptation and contributing to sustainable agriculture to face climate change.

Keywords: Adaptive mechanisms, climate change, food security, resilient cultivars, sustainability

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