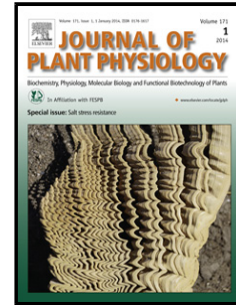


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# Physiological and proteomic analysis of maize seedling response to water deficiency stress

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**Abstract:** Low water availability is a major abiotic factor limiting photosynthesis and the growth and yield of crops. Maize (*Zea mays*) is among the most drought-sensitive cereal crops. Herein, the physiological and proteomic changes of maize seedlings caused by polyethylene-glycol-induced water deficit were analyzed. The results showed that malondialdehyde and proline contents increased continuously in the treated seedlings. Soluble sugar content and superoxide dismutase activity were upregulated initially but became downregulated under prolonged water deficit. A total of 104 proteins were found to be differentially accumulated under water stress. The identified proteins were mainly involved in photosynthesis, carbohydrate metabolism, stress defense, energy production, and protein metabolism. Interestingly, substantial incongruence between protein and transcript levels was observed, indicating that gene expression in water-stressed maize seedlings is controlled by complex mechanisms. Finally, we propose a hypothetical model that includes the different molecular, physiological, and biochemical changes that occurred during the response and tolerance of maize seedlings to water deficiency. Our study provides valuable insight for further research into the overall mechanisms underlying drought response and tolerance in maize and other plants.

**Abbreviations:** ROS: reactive oxygen species; SOD: superoxide dismutase; ATP: adenosine triphosphate; PEG: polyethylene glycol; MDA: malondialdehyde; PS II: photosystem II; Fo: initial fluorescence; Fv: variable fluorescence; Fm: maximum fluorescence; SDS: sodium dodecyl sulfate; SDS-PAGE: SDS-polyacrylamide gel electrophoresis; MS: mass spectrometry; MS/MS: tandem mass spectrometry; 2-DE: two-dimensional gel electrophoresis; CAB: chlorophyll a/b-binding protein; OEE: oxygen-evolving enhancer protein; PRK: phosphoribulokinase; PGM: phosphoglucomutase; TPI: triosephosphate isomerase; GLP: germin-like proteins; HSP70: heat shock 70 kDa protein; PP2C: protein phosphatase 2C; AAT: aspartate aminotransferase.

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