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Investigating Synergistic Interactions between Selenium and Microbial-Based Biostimulants to Improve Drought Tolerance in Spring Wheat

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Abstract

Drought stress is one of the major constraints to agricultural productivity worldwide related to global change, which requires the adaptation of farming systems to reduce this threat to global food security. Selenium (Se) is an important mineral nutrient that can stimulate plant growth and confer increased tolerance against environmental extremes including drought. Similarly, the use of microbial plant inoculants is discussed as a strategy to improve nutrient acquisition and stress resilience of crops. In this study, we investigated the potential synergistic effects of Se supplementation in combination with selected microbial consortia supplied in a protective organic fertiliser formulation (Minigran®), to mitigate the drought stress symptoms in spring wheat grown under controlled conditions in greenhouse studies. Initially, we optimised the Se (sodium selenite) level for application in wheat, which was already effective at extremely low application rates of 0.05 mg kg^{-1} soil. Our results showed that the combined Se application with microbial consortia considerably enhanced the drought tolerance in wheat through maintenance of leaf water potential (relative water content), regulation of phytohormones (abscisic acid, jasmonic acid, indole acetic acid), accumulation of stress-related osmoprotectants (proline, glycine betaine, total phenolics) and high activities of antioxidative enzymes (total antioxidant activity, ascorbate peroxidase) responsible for reduced oxidative leaf damage and increase in plant growth and biomass, compared with untreated controls but had no effects on the nutrient status. In conclusion, due to the low Se demand, selenate could be easily included in the formulation of the selected microbial inoculants providing perspectives for synergistic drought-protective effects.

Keywords: Microbial consortia, organic amendments, selenate, *Triticum aestivum*, water stress

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