



رقم البحث: (السادس)

عنوانه الانجليزي
Rebalancing Nutrients, Reinforcing Antioxidant and Osmoregulatory Capacity, and Improving Yield Quality in Drought-Stressed *Phaseolus vulgaris* by Foliar Application of a Bee-Honey Solution.

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ملخص البحث (السادس) باللغة الانجليزية

Bee-honey solution (BHS) is considered a plant growth multi-biostimulator because it is rich in osmoprotectants, antioxidants, vitamins, and mineral nutrients that can promote drought stress (DtS) resistance in common bean plants. As a novel strategy, BHS has been used in a few studies, which shows that the application of BHS can overcome the stress effects on plant productivity and can contribute significantly to bridging the gap between agricultural production and the steady increase in population under climate changes. Under sufficient watering (SW (100% of crop evapotranspiration; ETc) and DtS (60% of ETc)), the enhancing impacts of foliar application with BHS (0%, 0.5%, 1.0%, and 1.5%) on growth, productivity, yield quality, physiological-biochemical indices, antioxidative defense ingredients, and nutrient status were examined in common bean plants (cultivar Bronco). DtS considerably decreased growth and yield traits, green pod quality, and water use efficiency (WUE); however, application of BHS at all concentrations significantly increased all of these parameters under normal or DtS conditions. Membrane stability index, relative water content, nutrient contents, SPAD (chlorophyll content), and PSII efficiency (Fv/Fm, photochemical activity, and performance index) were markedly reduced under DtS; however, they increased significantly under normal or DtS conditions by foliar spraying of BHS at all concentrations.

The negative impacts of DtS were due to increased oxidants [hydrogen peroxide (H₂O₂) and superoxide (O₂•-)], electrolyte leakage (EL), and malondialdehyde (MDA). As a result, the activity of the antioxidant system (ascorbate peroxidase, glutathione reductase, catalase, superoxide dismutase, α-tocopherol, glutathione, and ascorbate) and levels of osmoprotectants (soluble protein, soluble sugars, glycine betaine, and proline) were increased. However, all BHS concentrations further increased osmoprotectant and antioxidant capacity, along with decreased MDA and EL under DtS. What is interesting in this study was that a BHS concentration of 1.0% gave the best results under SW, while a BHS concentration of 1.5% gave the best results under DtS. Therefore, a BHS concentration of 1.5% could be a viable strategy to mitigate the DtS impairment in common beans to achieve satisfactory growth, productivity, and green pod quality under DtS.