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

Induction of water stress tolerance in soybean by multifunctional micro-organisms

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Abstract

Soybean is mostly cultivated in Brazil during the rainy season (October to January), when usually occurs short periods without rain, imposing water stress for the crop. Plant growth promoting rhizobacteria (PGPR) can help mitigate these stresses by inducing water deficit tolerance. The objective of this work was to evaluate the effect of PGPRs on soybean cultivated under water stress. Two water stress inducing isolates (M 163 and BRM 034008), two AIA producing isolates (Ab-V5 and BRM 063574) and two phosphate solubilising isolates (BRM 063573 and BRM 67205), as well as their combination, were evaluated, totaling 16 treatments. The experiment was carried out under greenhouse conditions in a randomised block design with four repetitions. Water stress was applied at flowering for 15 days. Plant growth (shoot dry mass - SDM, root length - RL, root surface area - RSA, root diameter - RD and root volume - RV), gas exchange (internal CO_2 concentration - Ci, transpiration - E, stomatal conductance - gs and photosynthetic rate - A) and grain yield components (pod mass - PM, pod number - PN, number of grains - NG and grain mass - GG) were determined. The treatments BRM 063574+BRM 67205+M 163, Ab-V5+BRM 67205+BRM 034008, Ab-V5, BRM 063573 and BRM 034008 increased the growth of roots and shoots of the soybean. The gas exchange parameters were benefited by BRM 063574+BRM 67205+BRM 034008, BRM 063574+BRM 063573+M 163, BRM 063574+BRM 063573+BRM 034008, Ab-V5+BRM 67205+BRM 034008, Ab-V5, and BRM 67205. On the other hand, the soybean yield components were improved by BRM 063574+BRM 67205+M 163, BRM 063574+BRM 063573+M 163, Ab-V5+BRM 67205+BRM 034008, Ab-V5, BRM 67205, and BRM 034008. Considering the response of the growth parameters, gas exchange, and grain production, the co-inoculation treatments containing the isolates BRM 063574, BRM 67205, BRM 034008 and Ab-V5 provided greater soybean tolerance to water stress. Thus, the agronomic efficiency of the isolates must be evaluated in future field tests, aiming to guarantee better productive stability of soybeans under conditions of water stress.

Keywords: Coinoculation, water stress, soybean, rhizobacteria, Brazil

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