

Rhizobia-Containing Rhizobacterial Consortia and Intercropping Improved Faba Bean and Wheat Performances Under Stress Combining Drought and Phosphorus Deficiency

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Abstract : Our study aimed to assess, the role of inoculation of faba bean/wheat intercrops with selected rhizobacteria consortia gathering one rhizobia and two phosphate solubilizing bacteria "PSB" to alleviate the effects of combined water deficit and P limitation on Faba bean/ wheat intercrops versus monocrops under greenhouse conditions. One *Vicia faba* L variety (Aguadulce "Ag"), and one *Triticum durum* L. variety (Karim "K") were grown as sole crops or intercrop in pots containing sterilized substrate (sand: peat 4:1v/v) added either with rock phosphate (RP) as the alone P source (P limitation) or with KH_2PO_4 in nutrient solution (P sufficient control). Plant inoculation was done using rhizobacterial consortia composed; C1(Rhizobium laguerreae, Kocuria sp, and Pseudomonas sp) and C2 (R. laguerreae, Rahnella sp, and Kocuria sp). Two weeks after inoculation, the plants were submitted to water deficit consisting of 40% of substrate water holding Capacity (WHC) versus 80% WHC for well-watered plants. At the flowering stage, the trial was assessed, and the results showed that inoculation with both consortia (C1 and C2) improved faba bean biomass in terms of shoots, roots, and nodules compared to inoculation with rhizobia alone, particularly C2 improved these parameters by 19.03, 78.99, and 72.73%, respectively. Leaf relative water content decreased under combined stress, particularly in response to C1 with a significant improvement of this parameter in wheat intercrops. For faba bean under P limitation, inoculation with C2 increased stomatal conductance (gs) by 35.73% compared to plants inoculated with rhizobia alone. Furthermore, the same inoculum C2 improved membrane stability by 44,33% versus 16,16% for C1 compared to inoculation with rhizobia alone under P deficit. For sole cropped faba bean plants, inoculation with both consortia improved N accumulation compared to inoculation with rhizobia alone with an increase of 70.75% under P limitation. Moreover, under the combined stress, intercropping inoculation with C2 improved plant biomass and N content (112.98%) in wheat plants, compared to the sole crop. Our finding revealed that consortium C2 might offer an agronomic advantage under water and P deficit and could be used as inoculum for enhancing faba bean and wheat production under both monocropping and intercropping systems.

Keywords : drought, phosphorus, intercropping, PSB, rhizobia, vicia faba, *Triticum durum*

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