

The intercropping maize - common bean improves the rhizobial efficiency and P uptake in calcareous P-deficient soils

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Abstract

Through multi-local field experimentations during two growing seasons, this study aimed to check the introduction of legumes to enhance P availability in legume-cereal intercropping system, especially in calcareous P-deficient soils of Algeria agroecosystem. Can the positive interactions which are supported by efficiency in use of the rhizobial symbiosis (EURS) facilitate both grain yield and P uptake through an increase in the amount of P availability? To test these hypotheses, a field experiment was conducted in Setif agroecosystem, in the North of Algeria comparing sole culture of common bean (*Phaseolus vulgaris* L. cv. El Djadida) and maize (*Zea mays* L. cv. Filou), with common bean-maize intercropping. Crop system was practiced in two multilocal sites either P deficient (S1) or P sufficient soil (S2). P availability was increased in the rhizosphere of both species, especially when intercropped under P deficiency. This increase was associated with high rate of N₂ fixation by which common bean increase both EURS and nodule growth. The positive correlation observed between P

availability and nodule biomass confirmed increase of P availability in intercropping in low P soil. Increase in P availability contributed to moderate improvement of biomass and grain yield for both species grown as intercropping, though it only enhanced P uptake only for intercropped maize. Overall, this study demonstrated the positive effect of common bean introduction on growth facilitation of maize. In particular, common bean-maize intercropping showed a positive interaction by which common bean increased P uptake, plant biomass and grain yield for intercropped maize. This was achieved by improving the efficiency in use of the rhizobial symbiosis in calcareous P-deficient soils.

Keywords: P availability; P uptake, Intercropping; Symbiosis; Rhizosphere, Algeria