Book of abstracts

Phosphorus in Soils and Plants Symposium

Towards a sustainable phosphorus utilization in agroecosystems

FACULTAD DE AGRONOMÍA

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abstracts

Theme 2 - Phosphorus acquisition by plants and microorganisms
Oral presentation

Phosphorus mineralizing Bacillus co-inoculated with rhizobia interact with phosphorus fertilization to improve soybeans yield and affect bacterial rhizospheric community

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As most agricultural soils in the Southern hemisphere, Uruguayan soils where soybeans (Glycine max L.) are sown are low in available phosphorus (P). Therefore, the addition of phosphate fertilizers, a non-renewable and imported resource, is required. Often overlooked, soil organic P may count for 30-50% of total soil P, and it contains small rapidly cycling pools that can provide available P for crop uptake. Co-inoculation of soybeans with rhizobia and phosphorus-mineralizing bacteria (PMB) holds promise to improve P-uptake, crop yield, and sustainability. This study investigates the co-inoculation of soybeans with rhizobia and PMB Bacillus strains with and without addition of P fertilizer on plant P uptake and crop yield. The effect on the indigenous rhizosphere bacterial community in the field is also analyzed. The experiment was conducted at the experiment station INIA-La Estanzuela, Colonia, Uruguay, in a low available P soil without and with P-fertilization (7.7 and 15 µg g-1 of available P, respectively). The treatments were (1) Soybean seeds inoculated with Bradyrizhobium elkanii (control); and (2) Soybean seeds co-inoculated with Bradyrizhobium elkanii and formulated dried spores of either Bacillus megaterium ILBB592 or Bacillus pumilus ILBB44. The bacterial soybean rhizospheric communities were analyzed 30 days after sowing, using Illumina MiSeq sequencing of the bacterial 16S rRNA gene. The results showed that the P uptake and yield were increased by combining P addition and co-inoculation with Bacillus. P addition had an effect on the bacterial rhizospheric community increasing Actinobacteria and reducing Proteobacteria relative abundances, in comparison with the unfertilized plots. In contrast, when both P fertilization and Bacillus were added, the relative abundance of Actinobacteria were reduced and Proteobacteria increased. These results show that co-inoculation of P-mineralizing Bacillus and rhizobia has a synergistic effect on soybean growth and phosphorus nutrition and on the bacterial communities of the soybean rhizosphere.

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