

## **Biological nitrogen fixation in common bean: strategic management to improve yield and income increasing**

Common bean (*Phaseolus vulgaris* L.) is an important legume worldwide and nitrogen (N) is the most yield limiting nutrient and expensive input. Every year in Brazil common bean is cropped in an area about 3 million hectares, producing 3.2 million tons. The spends with N-fertilizers exceed U\$ 220 million per year. This crop can obtain N through the association with *Rhizobium tropici*, which perform the biological nitrogen fixation (BNF) process. Our studies under field conditions have shown a beneficial effect of the single inoculation of *R. tropici*, resulting in grain yield (GY) gain about 8% as compared with the N-fertilized treatment (80 kg of N ha<sup>-1</sup>). We also have found differential response of common bean genotypes to inoculation with *R. tropici*. Among fifteen common bean genotypes, the GY of the cultivar Aporé was 3296.25 kg ha<sup>-1</sup>, representing 22.3% more than the cultivar Diamante Negro. In addition, the mean GY of the fifteen genotypes was 2396.86, 2644.49, 2932.31 and 3211.50 kg ha<sup>-1</sup> for the control, *R. tropici* inoculation, *R. tropici*+50 kg N ha<sup>-1</sup> and 120 kg N ha<sup>-1</sup> treatments, respectively. However, the cultivars Aporé, Pérola and BRS Grafite obtained greater GY under *R. tropici* inoculation, *R. tropici*+50 kg N ha<sup>-1</sup> and 120 kg N ha<sup>-1</sup> treatments, respectively. Our most recent results have also shown a positive response of the co-inoculation of common bean with *R. tropici* and *Azospirillum brasilense*. The co-inoculation of *R. tropici* and *A. brasiliense* helped in the development and productivity of common bean, providing a significant increase in nodule number, shoot dry mass and root dry mass, resulting in a productivity around 3200 kg ha<sup>-1</sup>, with a significant increase in the GY of 11.5% and 26% compared to N-fertilized and *R. tropici* single inoculation treatments, respectively. Also, the co-inoculation returned about U\$ 1.53 for each U\$ 1.00 invested and in a net income of U\$ 2171.52 ha<sup>-1</sup>, resulting in U\$ 174.74 ha<sup>-1</sup> more than the N-fertilized treatment. Therefore, in addition to environmental advantages, the proper management of the BNF in common bean improves GY and has a positive financial return, higher than that observed for the N-fertilized treatment.

**Key words:** Soil bacteria, sustainability, plant growth, production cost