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[C3.3-4] Soil Management Strategy for Enhancing Crop Yields

Common Beans Grain Yield as Affected by Phosphorus Fertilization in the Sowing Furrow and FoliarAdriano Stephan Nascente* and Tarcisio Cobucci*Brazilian Agricultural Research Corporation (EMBRAPA), Rice and Beans Research Center, Santo Antonio de Goias, State of Goias, Brazil*

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The common bean (*Phaseolus vulgaris* L.) crop has great economic importance to Brazil, since the cultivated area in the 2010/2011 harvesting was about 4.01 million hectares, corresponding to production of 3.8 million tons of grains. Among the aspects to be improved in the crop is the management of the plant fertilization. The balanced and adequate supply of nutrients to the common beans by the use of fertilizer can provide significant increases in grain yield. In this sense, we have the phosphorus (P), an essential element in plant metabolism, which the response of common bean to the use of P in the soil is well-defined, contributing significantly to increasing grain yield, root development and favors the increase in the number of pods and grain mass. The need for P required by the common bean plants is less than that of potassium (K) and nitrogen (N), however, the amount applied is typically higher. This is due to the high rate of fixation in tropical soils, mainly caused by precipitation by Fe and Al, reaction with hydrous oxides of these metals and reaction with silicate clays. Because of this reason, the use of P from crops varies only from 5% to 25%. One option would be provide P through foliar fertilization, which could result in a reduction of the amount of P fertilizers applied to the soil, and can promote economic and environmental benefits, since P fertilizers are produced from the mineral reserves of non-renewable character. However, this practice is still carried out without scientific basis, making it difficult to obtain reliable results. The aim of this study was to test the hypothesis that foliar P application would increase the efficiency of utilization of P from soil by common bean fertilization.

The experiment was conducted at Embrapa Rice and Beans, located in the city of Santo Antonio de Goias, GO (16° 27' N, 49° 17' longitude and 823 m above sea level) for three consecutive years 2009, 2010 and 2011. The climate is classified as Aw, tropical savanna, mesothermal, according to Koppen's classification. The region's historical average of precipitation (1983-2010) was 32, 8.3, 4.3 and 12.6 mm precipitated in the months of May, June, July and August, respectively, and average temperatures of 21.8, 20.6, 20.8 and 22.6 °C in the same months, respectively. The soil is classified as Oxisol, clayey. The experiment was conducted in the area of no-tillage on straw of *Urochroa brizantha*. The experimental design was a complete randomized blocks, in a factorial design 4 x 4 with four replications. The treatments consisted of four levels of P applied to the soil (0, 40, 80 and 120 kg ha⁻¹ P₂O₅) and four levels of foliar P applied (zero, 831.3, 1662.6 and 2493.9 g P₂O₅ ha⁻¹). The dimensions of the plots were 4.5 m wide and 6 m long, resulting in an area of 27 m². The application of P in the soil was held together with the application of N and K during the sowing of common bean. The foliar P was provided by commercial product 'P51', which containing 1% of N and 51% of P₂O₅, the doses of each treatment was split in two applications. The first application occurred when the common bean had three trifoliate leaves and the second with six trifoliate leaves. For foliar spray it was used a manual sprayer with constant pressure of CO₂ with spray volume of approximately 100 L ha⁻¹. It was evaluated yield components (number of pods plant⁻¹, number of grains pod⁻¹ and weight of 100 grains), grain yield and P content in the whole plant (grain + leaves + stem + roots + pods). The increased in the rates of P applied to soil and foliar provided increased in the number pods m⁻², grain yield and P content in the common bean plant. The highest grain yield (3,446 kg ha⁻¹) was obtained with the combination of 120 kg ha⁻¹ of P₂O₅ in the soil with 1662 g of P₂O₅ ha⁻¹ foliar. The crop response to the application of P in the soil was increased with foliar application.

Keywords : *Phaseolus vulgaris*, mineral nutrition of plants, phosphorus, Cerrado.