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The Response of Common Bean (*Phaseolus vulgaris* L.) to Phosphorus as Influenced by Farmyard Manure

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Abstract

A field experiment was conducted in the Demonstration Farm of the Faculty of Agriculture, University of Khartoum at Shambat, in order to investigate the response of common bean (*Phaseolus vulgaris* L.) to the application of phosphorus and farmyard manure (FYM). The experiment was laid out in Split-plot design with four replicates. FYM treatments were allocated to the main-plots, and the phosphorus levels to the sub-plots. Seeds of common bean cv. Shendi were inoculated with *Rhizobium leguminosarum* bv. phaseoli USDA 2669 as a basic treatment. The treatments consisted of two rates of FYM (0 & 2.5 ton ha⁻¹) and five levels of phosphorus (0, 50, 100, 150, 200 kg P₂O₅/ha). Triple superphosphate (48 % P₂O₅) was used as a source of phosphorus in the experiment.

The results showed that, phosphorus application did not significantly affect the parameters examined and its effects was sometimes erratic and inconsistent. The beneficial effects of phosphorus to the plants that are grown in Shambat soil are little, due to its heavy clay alkaline nature (calcareous soils promptly converting the phosphorus fertiliser into insoluble forms). On the other hand, FYM application significantly affected soil organic matter and leaf phosphorus content. As a fertiliser, the value of FYM lies in the fact that it increases soil organic matter and thus improves availability of nutrients (especially N, P & micronutrients) to the plants. In addition to that, there was significant effect of the interaction between both factors on some growth and yield attributes (shoot dry weight & 1000 seed weight). This positive interaction may be due to the beneficial effect of FYM application on the availability of phosphorus to the plants. In addition to phosphorus, which was mineralised from the organic matter and became available to plants, organic matter also acts as chelating agents, thereby preventing the formation of insoluble phosphates. Furthermore, the application of organic matter to soil with high pH value not only supplies phosphorus, but on decomposition provides acidic compounds which increase the availability of mineral forms of phosphorus in the soil (i.e., extra CO₂ speeded up the solubility of phosphatic compounds).

Keywords: Calcareous soil, farmyard manure, organic matter, *Phaseolus vulgaris* L, phosphorus