Tropentag, September 18-21, 2016, Vienna, Austria

"Solidarity in a competing world — fair use of resources"

Response of Common Bean to Rhizobia Inoculation, Nitrogen and Phosphorus Across Variable Soils in Zimbabwe

Vongai Chekanai[1], Regis Chikowo[2], Ken Giller[3], Fred Kanampiu[4]

[1] *University of Zimbabwe, Crop Science Department, Zimbabwe*
[2] *Michigan State University, Plant Soil and Microbial Sciences, United States of America*
[3] *Wageningen University (WUR), Dept. of Plant Sciences, The Netherlands*
[4] *International Institute of Tropical Agriculture (IITA), Kenya*

Abstract

Soil fertility depletion ranks as the most important drawback to crop productivity in sub-Saharan Africa. Three on-farm experiments were conducted to explore the effect of nitrogen (N), phosphorus (P) and rhizobia inoculation on common bean productivity in Eastern Zimbabwe. Two common bean cultivars readily available on the market were tested in a split-plot arranged in randomised complete block design. The main plot was the combination of N (0 and 60 kg ha^{-1}) and P (0 and 20 kg ha^{-1}) and the sub-plot were cultivar (Gloria and NUA 45) and inoculation (+/- inoculum). Both N and P were applied at 20 kg ha^{-1} at planting and an extra 40 kg ha^{-1}N top dressing.

Number of nodules, active nodules and pods were significantly increased by N and P application. On a degraded site with 0.32 % SOC, none of the factors significantly increased grain yields ($p > 0.05$). Yields for control were a paltry 0.21 t ha^{-1} compared to 0.45 t ha^{-1} with N, P and rhizobia. Analysis of variance of grain yield for the two sites that had SOC > 0.6 % resulted in significant simple effects of N and P, and NP interaction ($p = 0.03$). Grain yields significantly increased from 0.49 t ha^{-1} (control) to 1.56 t ha^{-1} at 60 kg ha^{-1}N and 20 kg ha^{-1}P.

These results suggest that farmers can invest in both N and P for common bean production, but not in acutely degraded soils. Improved common bean cultivars currently on the market barely respond to the local rhizobia inoculum.

Keywords: Common bean, nitrogen, phosphorus, rhizobia, Zimbabwe

Contact Address: Vongai Chekanai, University of Zimbabwe, Crop Science Department, 5319 Budiriro 3, Harare, Zimbabwe, e-mail: vchekanai@gmail.com