

Soybean response to rhizobia inoculation on soils of variable nitrogen levels

Catherine Mathenge^{1,2}, Moses Thuita², Joseph P Gweyi-Onyango¹ and Cargele Masso²

¹Department of Agricultural Science and Technology, Kenyatta University, P.O BOX 43844-00100, Nairobi, Kenya

²International Institute of Tropical Agriculture, c/o ICIPE, P.O. Box 30772-00100, Nairobi, Kenya

Contact: cmathenge14@gmail.com; M.Thuita@cgiar.org; josephonyango2002@yahoo.co.uk; C.Masso@cgiar.org



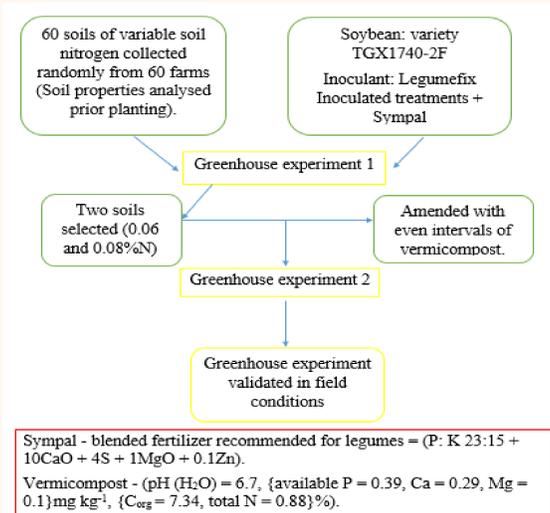
Abstract

Inoculation of soybean is an efficient way of increasing effective rhizobia population in the rhizosphere, but the performance is limited by soil fertility including nitrogen and carbon levels. This study demonstrated that amending soils of low N content with vermicompost can significantly increase soybean nodulation, shoot biomass, N uptake, and grain yield at $p < 0.05$.

Introduction

- Soybean (*Glycine max*) is an important oil and protein source for large population in Africa (Ohyama et al., 2011).
- Constraints such as low fertility, poor nodulation and low BNF limits its production.
- Inoculation of soybean with rhizobia is an alternative method to use of nitrogen fertilizers which are expensive, particularly in sub-Saharan Africa.
- Well established fact is low and high N levels depress effects of rhizobial inoculation (Ahmed, 2013).
- Objective of the study was to determine the performance of soybean inoculation on soils of variable levels of nitrogen (N) and organic carbon (Corg) and its improvement through soil N.

Materials and methods



Inoculant



Vermicompost

Results

Greenhouse experiment 1

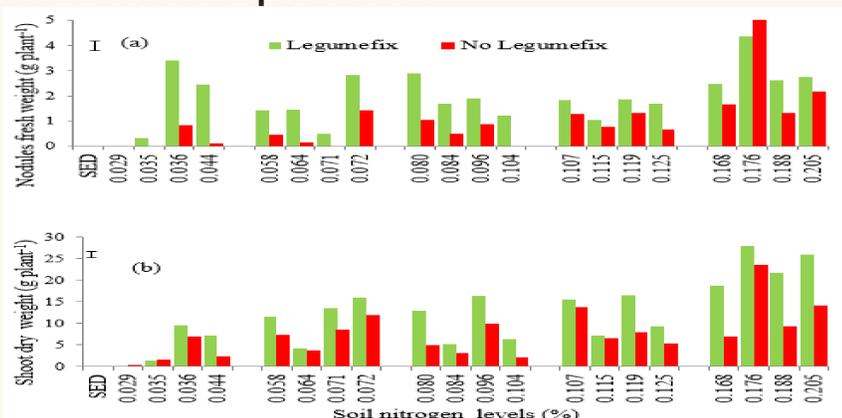


Fig.1. Soybean response to variable soil nitrogen levels and rhizobia inoculation (a) nodule weight (b) biomass.

Field experiment

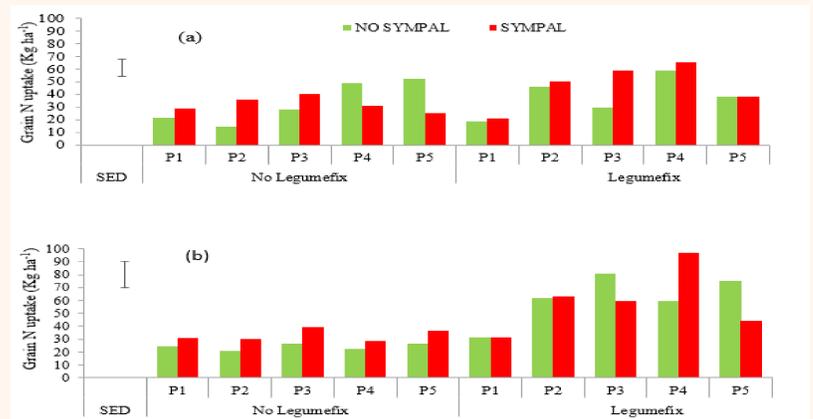


Fig. 2. Interactive effect of Sympal, Legumefix and vermicompost (P) on grain N uptake (a) 0.06%N (b) 0.08% N.

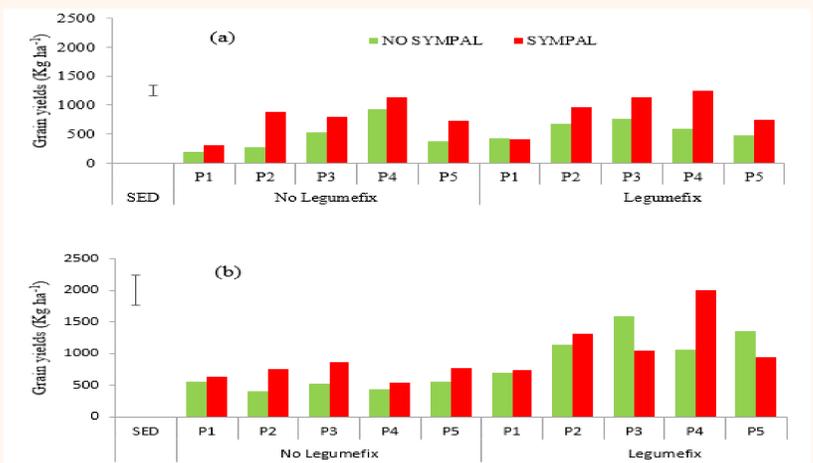


Fig.3. Interactive effect of Sympal, Legumefix and vermicompost (P) on grain yields (a) 0.06%N (b) 0.08% N.

Discussion

- Soybean response to variable soil N levels varied across the 60 soils.
- The soil with N = 0.08% performed better, which was consistent with the good chemical properties when compared to the soil of N = 0.06%.

Conclusion

- Nitrogen levels in soils of different physical and chemical properties were not suitable to assess the critical N values below and above which soybean response to rhizobia inoculants would be hindered; further investigation is required.
- Amending soils of low N levels with vermicompost increased soybean response to inoculation.

References

- Ahmed, F. E. (2016). Interactive Effect of Nitrogen Fertilization and Rhizobium Inoculation on Nodulation and Yield of Soybean (*Glycine Max* L.) Merrill.
- Ohyama, T., Sueyoshi, K., Yamamoto, M., Hung, N. V. P., Ohtake, N., Minagawa, R. and Takahashi, Y. (2013). Soybean seed production and nitrogen nutrition. INTECH Open Access Publisher.