



Can compost increase grain yield more than inorganic fertilizer in maize-sorghum rotational systems of South-western Nigeria?

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Introduction

Cereal-based cropping systems are essential to food security in sub-Saharan Africa (SSA). However, there are wide yield gaps due to low input and declining soil fertility. Inorganic fertilizers may improve yields yet are scarce and expensive. Under such conditions the conversion of organic waste to compost is an option to sustainably increase cereal grain yield in SSA. Hence, this study aims to explore the use of compost to increase grain yields in maize-sorghum rotational systems in south-western Nigeria.

Materials and methods



Alfisol, Ibadan, Nigeria.

- 6 Nutrient sources: PM, BL+PM, GR+PM, ME+PM, NPK and control.
- 2 Cocoa pod husk biochar: $\pm$ BC.
- 8 Co-composts: PM $\pm$ BC, BL+PM $\pm$ BC, GR+PM $\pm$ BC and ME+PM $\pm$ BC.
- 12 Treatments: co-composts, NPK $\pm$ BC and Control $\pm$ BC

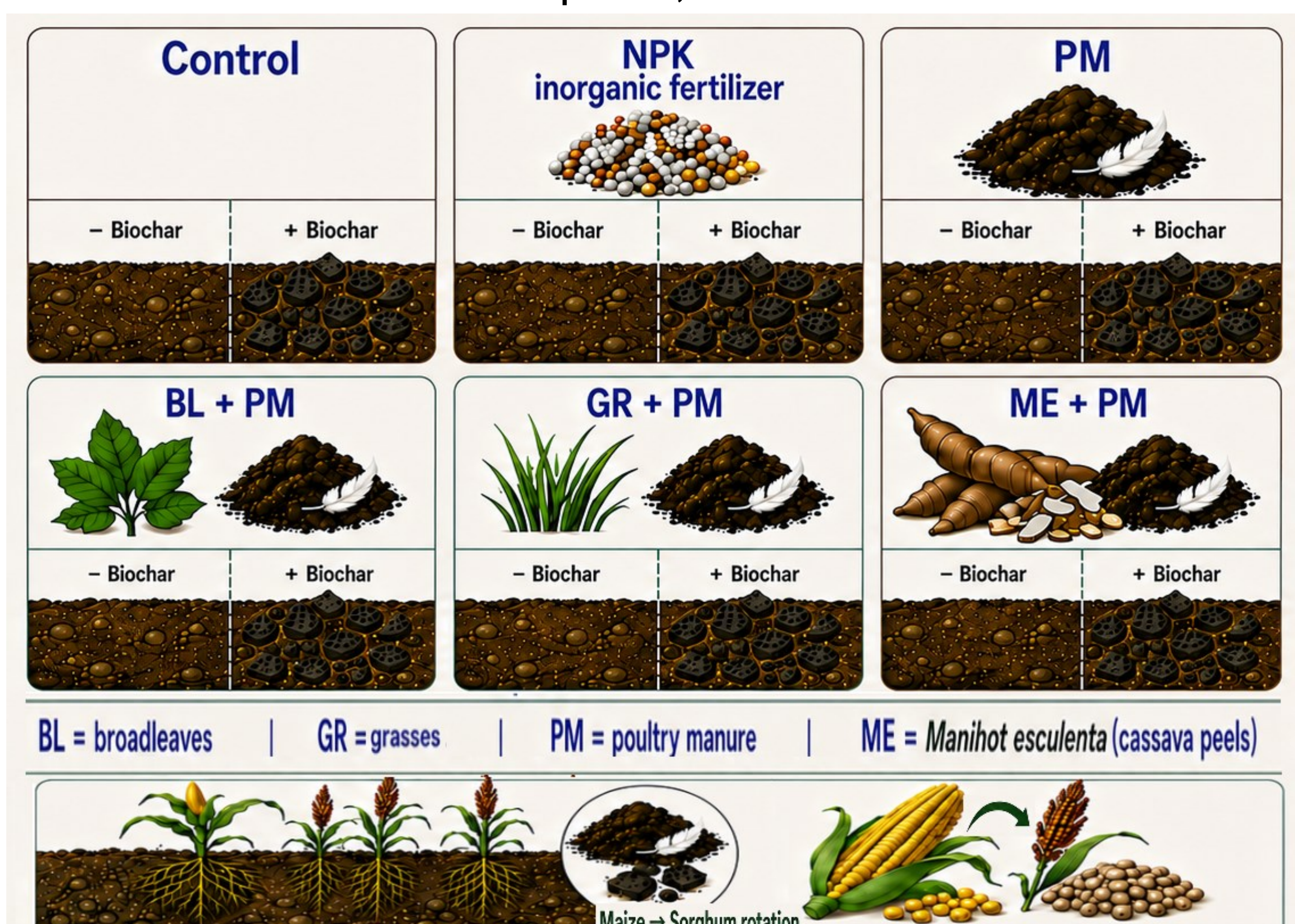


Figure 1. Treatment structure and trial overview

- NPK applied @ 120 kg N ha⁻¹, 26.2 kg P ha⁻¹, and 49.8 kg K ha⁻¹.
- Co-compost applied @ 15 t ha⁻¹.

Results

- The average maize yield of all treatments in 2023 and 2024 was 1407 kg ha⁻¹ and 2086 kg ha⁻¹ and for sorghum was 71 kg ha⁻¹ and 38 kg ha⁻¹, respectively.
- The average maize yield of other nutrient sources had 40% (Fig. 2a) and 36% (Fig. 2b) higher yield ($p < 0.01$) than control in 2023 and 2024, respectively.
- Maize yield of biochar amended treatments was 33% and 37% higher ($p < 0.01$) than without biochar in 2023 (Fig. 2c) and 2024 (Fig. 2d), respectively.
- Sorghum yield averaged across BL+PM and PM was 74% higher ($p < 0.01$) than control in 2023 (Fig. 3a) while in 2024, sorghum yield of PM was 57% higher ($p < 0.01$) than the average control yield, BL+PM and ME+PM (Fig. 3b).
- Sorghum yield with biochar in 2023 (Fig. 3c) and 2024 (Fig. 3d) was on average 42% higher ($p < 0.01$) than without biochar.

Highlights

- Poultry manure co-composted with biochar (PM+BC) produced the highest yields of all treatments, while all other co-composts outperformed the control and yielded comparably to inorganic fertilizer in both years.
- PM produced the highest maize and sorghum grain yields in 2023 and 2024 compared with all other nutrient sources.

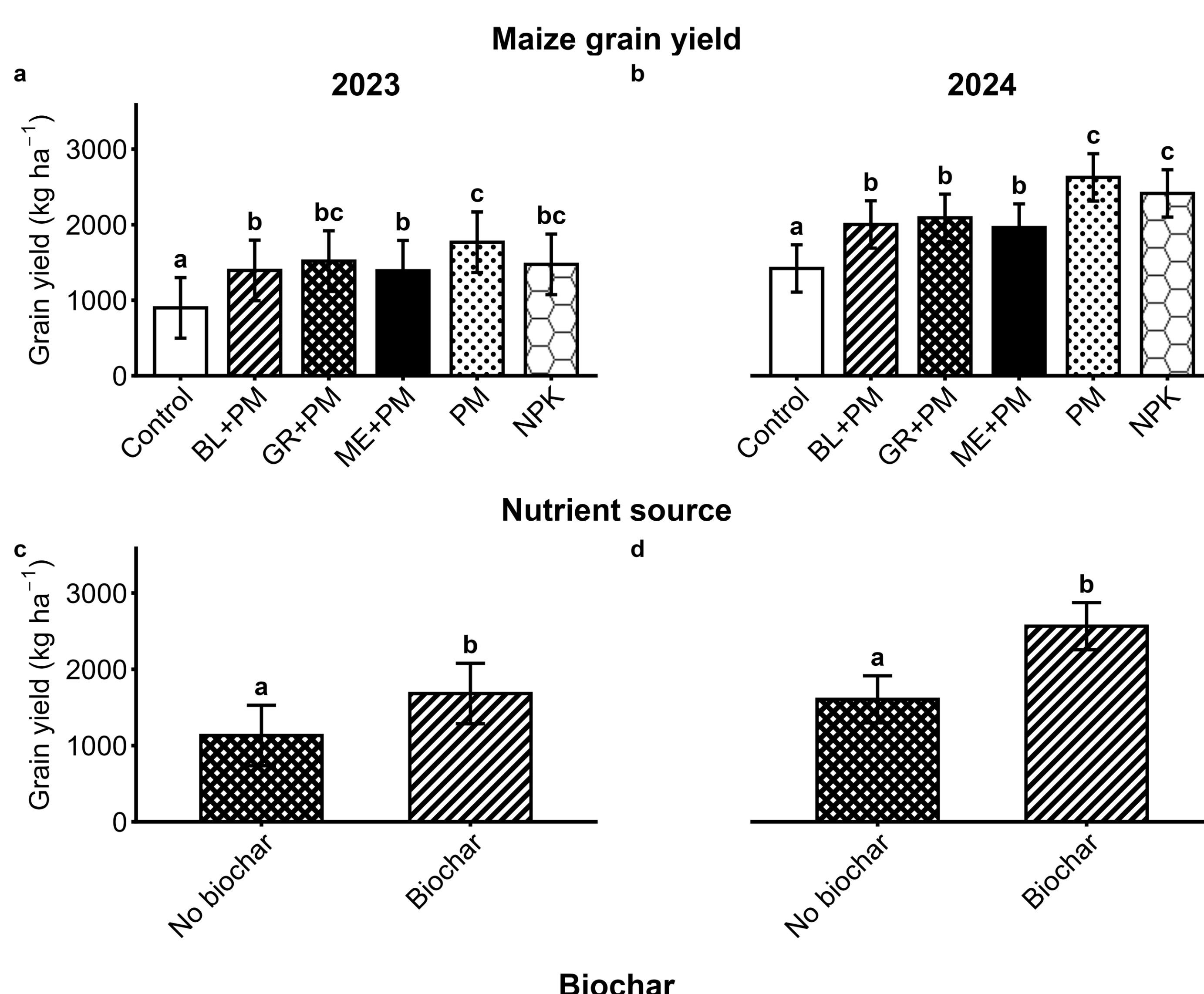


Figure 2. Maize yield in 2023 and 2024 in Nigeria

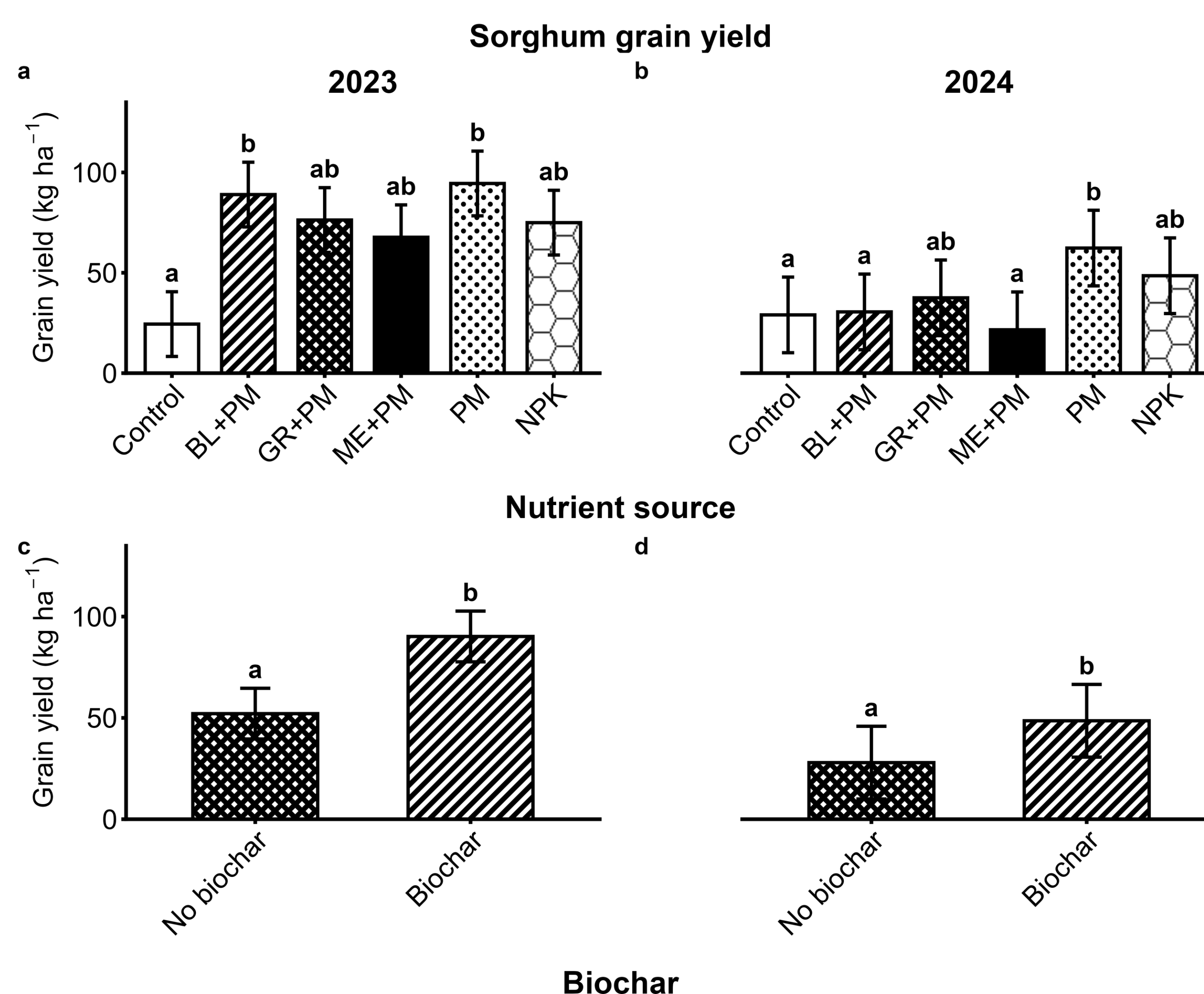


Figure 3. Sorghum yield in 2023 and 2024 in Nigeria

Conclusions

This study showed that co-composted PM can be recommended for a sustainable maize-sorghum rotational systems in Nigeria.

Co-composting organic wastes with biochar has the potential to narrow the yield gap in cereal-based cropping system and improve soil health in SSA.