Biochar amendment has stronger effects than fertilizer regimes on the bacterial community structure and ecological processes in broomcorn millet field on the Loess Plateau

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Abstract:【Objective】 Soil in the Loess Plateau is poor and vulnerable to erosion and degradation. Herein, we investigated the effects of biochar amendment (C) combined with N fertilizer (N150) and 30% organic manure replacing N fertilizer (NO30) on the soil in the Loess Plateau, with the aim of improving bulk soil and rhizosphere nutrient levels, bacterial community structure, ecological network, and assembly process in a broomcorn millet agroecosystem.**【Method】** A field trial was conducted using six treatments: N0, N150, NO30, N0+C, N150+C, and NO30+C.**【Result】** The results revealed that compared to no fertilizer and no biochar treatments, the addition of N fertilizer, organic manure substitution, and biochar amendment increased the nutrient contents of bulk soil and rhizosphere. Compared with no fertilizer, the NO30 treatment significantly improved the observed operational taxonomic units (OTUs) of rhizosphere soil at the jointing and flowering stages, whereas the N150 treatment significantly reduced the observed OTUs of bulk soil and rhizosphere at the jointing stage and those of bulk soil at the flowering stage. Meanwhile, compared with no biochar addition, biochar amendment increased the observed OTUs of bulk soil and rhizosphere. Furthermore, compared to fertilizer regimes, biochar amendment had a stronger effect on bacterial community composition and structure. Fertilizer regimes (N150 and NO30) had a lower network complexity than that of the no fertilizer regimes, whereas the N150+C treatment had the most complex network. The bacterial assembly after biochar amendment was a more deterministic process than that after the fertilization regimes. More importantly, NH4+-N in the bulk soil and rhizosphere was the major factor shaping the bacterial diversity, structure, and assembly process in the broomcorn millet agroecosystem.**【Conclusion】** Overall, biochar amendment has stronger effects than fertilizer regimes on the bacterial community structure and ecological processes in broomcorn millet field, this study provided valuable information for the sustainable development of dryland agriculture in the Loess Plateau.

Acknowledgements：National Millet Sorghum Industrial Technology System (No.CARS-06-A26)
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