Abstract

Crop cultivation positively or negatively impacts soil biodiversity and associated ecological services. The push-pull technology (PPT), a climate-smart cereal-*Desmodium* spp.-*Brachiaria* spp. Companion cropping system, is known for providing nature-based solutions for pest and soil fertility challenges and has been practiced in sub-Saharan smallholder farmer fields for more than two decades. However, the extent to which this cropping system affects soil arthropod biodiversity in general and Collembola in particular is not well known. This study assessed the long-term effects of PPT on soil physicochemical properties, abundance, and diversity of Collembola communities, and soil biological quality (QBS) as indicators of soil health. Soil was collected from five maize monoculture and five push-pull smallholder farmer fields in western Kenya. Soil physicochemical properties were analysed using Walkley-Black and Bouyoucos hygrometer method. Collembola abundance and diversity were assessed following the Berlese funnel extraction method and morphological identification. Soil health was evaluated using a Collembola-based soil biological quality (QBS-c) index. Soil physicochemical properties significantly differed between push-pull and maize monoculture fields, with push-pull soils being less acidic, and having higher quantities of nitrogen and carbon. Compared to monoculture, push-pull soils had significantly higher number and diversity of Collembola, and QBS-c index values. Significant positive correlations were observed between Collembola abundance and soil pH, nitrogen, carbon, phosphorous, and electrical conductivity. This study provides experimental evidence that crop diversification through a push-pull cropping system soil legacies positively impacts Collembola abundance and diversity, serving as bioindicator of healthy soils.