

Abundance and diversity of earthworms following six years of tillage, fertilizer and weeding regimes in a maize field in northern Zimbabwe

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Abstract

Earthworms are a major component of soil fauna communities with positive effects on soil chemical, biological and physical processes. A study was carried out at Chinhoyi University of Technology experimental farm, Zimbabwe, to investigate the medium-term effects of cultural practices on earthworm communities in a maize-based cropping system. Data were collected in the 2018/2019 cropping season from a six-year old experiment with tillage system (conventional, rip line seeding and basin planting), fertiliser application rate (zero, low: 35.2 kg ha⁻¹ N + 12.2 kg ha⁻¹ P₂O₅ + 6.6 kg ha⁻¹ K₂O, medium: 41.5 kg ha⁻¹ N + 14 kg ha⁻¹ P₂O₅ + 7 kg ha⁻¹ K₂O, and high: 83 kg ha⁻¹ N + 28 kg ha⁻¹ P₂O₅: 14 kg ha⁻¹ K₂O.) and weeding intensity (twice, four times and clean weeding) as the main, sub- and sub-subplots, respectively. *Lumbricus* (34.4%) and *Diplocardia* (38.3%) were the dominant genera while endogeic earthworms (48.4%) dominated the community structure among other earthworm functional groups. *Lumbricus* abundance, total earthworm abundance, genus richness and Shannon diversity index were higher in clean weeded plots under the basin planting system relative to other treatments. Inorganic fertiliser application in the conventional tillage (CT) system reduced *Eisenia* abundance and genus richness. There was a positive correlation between total earthworm abundance ($r = 0.34$, $P < 0.001$) and negative correlation of *Diplocardia* abundance ($r = -0.21$, $P < 0.05$) with maize grain yield. These results suggest that in minimum tillage systems clean weeding has positive effects on earthworms while in CT, application of high doses of inorganic fertiliser is detrimental to earthworm communities.

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