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Article | DOI: 10.21307/jofnem-2021-038

JOURNAL OF NEMATOLOGY
e2021-38 | Vol. 53

Free-living nematode assemblages associated with maize residues and their ecological significance

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This paper was edited by Maria Viketoft.

Received for publication December 13, 2020.

Abstract

Return of plant residues to the soil is a sustainable way of enhancing plant growth, health, and levels of soil quality. In Kenya, maize plant residues are the most commonly returned plant material in many agro-ecosystems. For any plant material to release nutrients into the soil, it must undergo a decomposition process that is usually affected by various organisms, especially nematodes. Despite their great contribution to the breakdown of plant organic matter, there is a dearth of information on the interaction between maize residues and free-living nematodes (FLN) in Kenya. In this respect, this study aimed to assess the influence of decomposing maize residues on FLN dynamics and the soil food web in Mwea, Kenya. The experimental plots were set up in a randomized complete block design, comprising of decomposition plots (incorporated with maize residue to a depth of 30 cm at a rate of 5 tons/hectare), while the plots unincorporated with maize residues were used as the control. Each treatment consisted of four replicates. In all, 30 FLN genera were recovered from the field trials, whereby *Acrobeles* was significantly abundant in decomposition plots in both seasons. We subsequently found that maize residues reduced the abundance of enrichment opportunist bacterivores (cp-1) relative to general opportunist (cp-2) bacterivores and fungivores. Notably, the results of the channel index showed that the decomposition of maize residues was dominated by fungal energy channels throughout the study in the two seasons. These results suggest that maize residues need to be coupled with a suitable labile organic matter. This would lead to sustainable, active, and reliable turn-over of maize residues into the soil food web ecosystems. The application of labile materials can also help to improve the population of enrichment bacterivores that are essential in the decomposition process. This study shows that the decomposition of maize residues influenced FLN composition, mainly the enrichment opportunist bacterivores whose abundance was lower.

Keywords
Decomposition, Ecological significance, Free-living nematodes, Maize residue, Soil food web.

Decomposition is a microbial process that involves the breakdown of complex organic compounds into less complex inorganic materials (De Mesel et al., 2006; Yadav et al., 2018). This process is fundamental for the release of immobilized nutrients such as nitrogen from plant residues into the soil. Plant residues, including maize leaves and stalks, provide energy to the soil food web in form of organic carbon and nitrogen, and also protect the soil against rain and wind erosion. In addition, plant residues are