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Ecological intensification of maize-kale systems in Kenya by biofertilisation and push-pull management shifts nematode communities

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Abstract

Plant-parasitic nematodes (PPNs) pose a persistent threat to vegetable production in Kenya, contributing to reduced yields and soil degradation. The management of PPNs in vegetables in Kenya has largely remained unaddressed. The integration of ecological intensification strategies such as the vegetable integrated push-pull (VIPP) system and the use of black soldier fly frass fertiliser (BSFF) is gaining traction in sustainable agriculture. The aim of this study was to determine the effects of integrating VIPP and BSFF on nematode abundance and diversity in maize-kale cropping systems. Field trials were conducted in two different agroecological zones in Kenya. Each trial had 12 treatments replicated four times and six treatments were assigned to each crop (maize and kale). The treatments were as follows: 1. Control (non-amended monocrops), 2. Inorganic fertiliser (DAP and NPK) treated plots, 3. VIPP plots, 4. BSFF-amended plots, 5. VIPP and BSFF plots with either maize or kale, and 6. VIPP and BSFF plots with both maize and kale. Soil samples were collected from experimental plots and nematode community composition determined using modified Baermann technique. Plots under VIPP augmented with BSFF exhibited significantly higher populations of free-living nematodes and lower densities of PPNs compared to control and inorganic treated plots. The use of VIPP, particularly in combination with BSFF, enhanced the abundance of bacterivorous and fungivorous nematodes, suggesting improved soil health and biological control potential. The findings demonstrate that VIPP and BSFF synergistically promote assemblages of beneficial nematode communities, providing a sustainable pathway for management of nematodes in agroecological farming systems.

Keywords: Cropping system, kale, maize, regenerative agriculture, soil health

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