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Nematode management in the face of climate change: From chemical control to climate-smart soil systems

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Abstract

Potato (*Solanum tuberosum*) production in sub-Saharan Africa is increasingly constrained by nematodes, particularly *Meloidogyne* spp. (root knot nematodes) and Globodera rostochiensis (potato cyst nematode). Under changing climatic conditions, the impacts of these nematode pests are expected to intensify. Rising temperatures will translate into shorter nematode life cycles leading to more rapid population build-up, while erratic rainfall patterns will increase crop vulnerability. Tightening environmental regulations will also further limit conventional chemical nematicide use. This creates additional pressure for developing and identifying suitable nematode management strategies that are both effective and compatible with climate-resilient agricultural systems. The banana fibre technology has been shown to be such a promising option, as a precision delivery system for low dose nematicides, which outperform recommended applications leading to reduced total chemical inputs. Our studies have also shown that the use of impregnated banana fibre limits the negative impact to soil microbial communities. Using banana fibre to deliver microbial biological products can also be effective, including on the microbiome. Our finding highlights the potential of fibre-based delivery systems to enhance input-use efficiency and reduce environmental loading. Beyond field performance, this work contributes to a broader shift toward planning for future climates by using climate smart technologies. Our ongoing studies using phytotrons are designed to simulate future climate conditions (elevated CO_2 and temperature) and assess their effects on crop nutritional quality and pest susceptibility. This will be critical for understanding how climate stress alters host resistance, nematode dynamics, and overall soil system resilience, allowing us to better prepare effective solutions.

Keywords: Biocircular economy, climate-smart agriculture, *Globodera* spp., precision delivery

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