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Impact of Organic and Mineral Fertilisation on Banana Growth and Nematode Populations on Different Soils in Costa Rica

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Abstract

The two main phytosanitarian problems of banana production in Latin America and the Caribbean are the fungal pathogen *Mycosphaerella fijiensis* Morelet causing the foliar disease Black Sigatoka and the soil nematode infestation of *Radopholus similis*. Fungicides, nematicides and mineral fertilisers therefore applied at high rates lead to excessive economic and ecologic costs. Small scale producers cannot afford these inputs and are highly dependent on alternative technologies. In prior experiments foliar applications of vermicompost-teas from coffee pulp showed beneficial effects on Black Sigatoka resistance.

The present study aims at studying the impact of organic and mineral fertilisation on banana growth and nematode populations on different soils (Inceptisols and Andic Inceptisols) under greenhouse conditions. Soil applications of vermicompost-tea on nematode infestation and banana seedling growth were compared to a standard mineral fertilisation programme and a control treatment. We used topsoils from 2 high and 2 low banana productivity sites in Costa Rica. Banana seedling growth was monitored over 20 weeks. Growth indicators such as “formation of new leaves”, “diameter of the pseudo- thallus”, “shoot length” and “weight” were measured every two weeks. Infestation by nematodes was determined at the end of the experiment after 20 weeks. Nutrient contents of the organic fertiliser, and soil chemical and biological characteristics of the different soils were evaluated as well.

After 20 weeks nematode populations in soil were higher with mineral fertilisation than with vermicompost-tea treatment and the control. Growth of banana seedlings (shoot length, formation of new leaves, weight) was highest with mineral fertilisation, followed by vermicompost-tea and the control. Minerally fertilised plants exceeded all other treatments by far. Soil types affected growth of banana seedlings as well.

Soil application of vermicompost-tea is economically not feasible due to its low nutrient content. We speculate the tendencies towards better growth rates utilising the vermicompost-tea compared to the standard to be due to the fertilisers microbial support to soil biology. Further studies are required as regards the application of vermicompost-teas and other bio-products in order to develop ecologically and economically sound alternatives to the highly toxic nematicides.

Keywords: Biocontrol, Black Sigatoka, Musa (AAA), nematode management, organic fertiliser

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