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Improving Methods for Inoculation of Endophytic *Fusarium oxysporum* to Tissue Culture Banana Plants

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Abstract

Bananas (*Musa* spp.) are among the most important food crops worldwide. Plant-parasitic nematodes and insects are major limiting factors affecting cooking banana production in East Africa. The use of endophytic microorganisms that colonize the root system is a novel tool for biological management of plant parasitic nematodes on other crops in particular banana. Mutualistic fungal endophytes are known to improve plant growth, induced resistance, reduce nematode, insect and fungal diseases. It has also been shown that they produce metabolites that are toxic to these pests. The objective of this study was the improvement of existent methods of inoculation and the development of new techniques for apply endophytes to tissue culture banana plants before transplanting to the field. The investigations were tested in the production system of an established banana tissue culture producer in Uganda, Agro-Genetic Technologies Ltd. (AGT). Farmers buy clean planting material at AGT and plant the disease free tissue culture plants into fields contaminated with pests and diseases. The goal was to improve endophyte colonisation of these commercial plantlets, in order to provide healthy and biologically enhanced plants to the farmers. Two inoculation techniques were tested; in the first, the maize-bran technique as developed the International Institute of Tropical Agriculture (IITA-Uganda) and in the second, a new inoculation technique in which plants were set in planting trays and then the trays drenched in a spore suspension as developed by Bioversity (Costa Rica). These experiments were conducted at the facilities of AGT in Uganda with a nematode antagonistic *Fusarium oxysporum* isolate with known biological control activity. The results indicated a negative effect of the maize bran carrier on banana plant growth. There was a negative relationship between the amount of maize bran used and plant growth as well as plant mortality. In contrast the inoculation of the endophyte with the tray-soil drenching method produced resulted in effective colonisation of roots and corms by the non-pathogenic *F. oxysporum* antagonist. The results of this study demonstrated, the use of soil drench inoculation of endophytes resulted in a more labour and time effective inoculation system for commercial tissue culture banana plantlet inoculation.

Keywords: Banana, endophyte inoculation, *Fusarium oxysporum*, tissue culture, Uganda