

## CHAPTER 1

### INTRODUCTION

Uganda is a major producer and consumer of bananas in Africa (Karamura, 1993). Over 80% of the bananas grown are East African highland bananas (genotype *Musa* AAA) (Karamura *et al.*, 1996) and approximately 8% of the total banana production consists of the recently introduced cultivar *Pisang Awak* (genotype *Musa* ABB). Banana growing is generally at the subsistence level with some farms raising surplus for family income. A few large-scale cooking banana farms exist in parts of the country.

Ugandan banana farming is under pressure from continuously declining production due to biotic and abiotic factors that vary between farmers and regions. The counter-productive biotic factors include plant parasitic nematodes, banana weevil, leaf diseases, *Fusarium* wilt and, Banana Streak Virus. The major abiotic constraints are from declining soil fertility as a result of intensive land use or conversely a reduction of farm inputs such as mulches. Thus small-scale Ugandan farmers are often confronted by a complex of agricultural constraints which are beyond their means for management. Furthermore, all inorganic fertilizers are imported in Uganda (FAO, 1991), making these applications financially restricted. The use of nitrogen bearing fertilizers dropped by 64% between 1980 and 1990. Similarly, the use of phosphorus fertilizers declined by

45% (Bekunda and Woome, 1996) Pest management options available consist exclusively of cultural controls: clean planting material (i.e. paring and/or hot water treatment of banana suckers) and crop sanitation (i.e. removal of post-harvest residues). Crop sanitation requires continual labour from the farmer and is of uncertain value. However, clean planting material can significantly increase the performance of newly established plantations. These plants will have an increased tolerance to pests and diseases. Generally within a period of three to four years, these plants will get re-infested.

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Scientists have recognized the potential for manipulation of biological factors to create sustainable plant growth. The beneficial effects on growth and health of plants of economic importance and the increased concern for environmental quality have made biological factors important components for management practices in agricultural systems. Soil is a natural resource whose proper management is important for food security. A major component of soil management in agriculture involves maintenance, replacement and enhancement of the natural soil biota. Such a critical component includes AMF (arbuscular mycorrhizal fungi), which form mutualistic associations with the roots of most vascular plants.

*ability of AMF, isolated from Ugandan banana farm soils, to colonize micropropagated banana plantlets.*

Colonization of plant roots by AMF has been shown to have very beneficial effects for plant growth. Some of these effects include: increased uptake of phosphorus, zinc and other minerals (Ames *et al.*, 1983); reduction in the

incidence of disease (Dehne, 1982); increased transplant uniformity; reduction of both transplant morbidity and mortality; and improved drought tolerance (Auge *et al.*, 1986) by such means as decreasing leaf water potential, reducing stomatal and root hydraulic resistances, and increasing transpiration rates (Allen and Boosalis, 1983). The beneficial effects seen on micropropagated plants include: improved rooting; enhanced root function (absorption and translocation); and increased vitality (Varma and Schuepp, 1995).

It is my interest to investigate AMF occurring naturally in Uganda and experiment by introducing these fungi to micropropagated banana plants in attempts to form a successful association between the plant and the fungus. Micropropagated banana have been shown to have a high arbuscular mycorrhizal dependency (Rizzardi, 1990; Jaizme-Vega and Azcon, 1995).

The aims of this study are to:

- 1 Determine the mycorrhizal inoculum potential of Ugandan banana farm soils and statistically examine some factors for correlations.
- 2 Identify some AMF from Ugandan banana farm soils.
- 3 Determine the ability of AMF, isolated from Ugandan banana farm soils, to colonize micropropagated banana plantlets.