1. INTRODUCTION

1.1 Background

Plant parasitic nematodes cause significant damage and losses to most agricultural crops in the tropics and sub-tropics (Luc et al. 2005). The need to control and manage nematode population to acceptable levels remains a big concern for nematologists. The need to reduce dependence on chemical control using nematicides and the increased pressure to use pest control measures that do not pollute or degrade the environment has provided the impetus for more research geared towards the search and exploitation of potential biological control agents of plant parasitic nematodes (Cook 1988). Biological control involves the reduction of inoculum potential of a disease causing pathogen or parasite in its active or dormant state by one or more organisms accomplished naturally or by manipulation of environment, host or antagonists or by mass introduction of one or more antagonists (Baker & Cook 1974). Stirling (1991) defined biological control of nematodes as “the reduction of nematode population through the action of living organisms other than the nematode resistant host plant, and which occurs naturally, or through manipulation of the environment or manipulation of antagonists.”

Nematodes have long been known to have numerous antagonists (Kerry 1987). Several organisms have been described and exploited for the management of plant parasitic nematodes in agricultural crops. A large number of organisms including fungi, bacteria, viruses, predatory nematodes, insects and mites have been found to parasitize on the veriform stages of nematodes or female eggs of root-knot nematodes or cyst nematodes (Stirling 1991).

More recently the use of endophytic microorganisms resident within plant tissues for the protection of plants against pests and diseases has been exploited, the most studied is the grass endophyte association in which endophytic fungi associated with grasses have been shown to protect grasses against pest and diseases, most grass endophytes are members of the Ascomycetes family Clavicipitaceae (Clay 1991). Biological control with endophytes has mostly emphasized residents or mutualistic fungi of grasses which renders hosts
unpalatable to herbivores and insects (Clay 1988, 1989) detrimental effects of grass endophytes on fungal pathogens has also been demonstrated. For example isolates of *Acremonium lolii* Link ex Fries, and *A. coenophialum* Morgan-Jones and W. Gams showed antibiosis against a range of fungal plant pathogens in culture (White & Cole 1985). Research on grass endophytes has clearly demonstrated the nature and extent of protection afforded to the host plants by the interactions, with mutualistic associations between grasses and endophytic fungi benefiting the host plants in most circumstance (Clay 1990). In mutualistic association, endophyte-infected plants are protected from attack by some species of insects, nematodes and fungi while in return, the endophyte is provided with shelter and nutrition by the host plant (Latch 1993; Saikkonen et al. 1998; Schardl et al. 2004).

Although most reports on host plant infection by endophytes concern grass endophytes, symptomless infection of other plants by endophytic fungi belonging to diverse taxonomic groups have been known for many years (Carroll 1988). The presence of endophytes has been demonstrated in many plants, including important crops such as banana (Brown et al. 1998; Pereira et al. 1999; Cao et al. 2004a; Cao et al. 2004b; Cao et al. 2005), maize *Zea mays* L. (Fisher et al. 1992), rice *Oryza sativa* L. (Fisher & Petrini 1992), and tomato *Lycopersicon esculentum* Mill. (Hallmann & Sikora 1994c; Cao et al. 2004a). Some principle groups of root colonizing plant beneficial fungi, which have developed symbiotic relationship with the host plants belong to the *Fusarium* sp and *Trichoderma* sp (Haas & Defago 2005).

In this review the role of endophytic fungi in the management of plant parasitic nematodes as well as plant growth improvement in agricultural crops is discussed, since limited information is available on the use of endophytic fungi to control root-knot nematodes *Meloidogyne incognita* in tomatoes, this review focused on existing literature between endophytes and plant parasitic nematodes in grasses and other crops, highlighting the implication of plant infection by endophytic fungi, and discussed the beneficial effects of endophytic fungi in the management of plant parasitic nematodes as well as promoting plant growth.
1.2 Research Objectives

1. Exploration of root endophytic fungi of tomato.
2. To obtain potential endophytic fungi of tomato that can reduce population of root-knot nematode and improve plant growth.
3. To investigate the mechanisms by which endophytic fungi suppress root-knot nematodes.

1.3 Hypothesis

1. Treatment of tomato plants with endophytic fungi increases induced resistance of tomato plants against infection by root-knot nematodes.
2. Treatment of tomato plants with endophytic fungi increases growth performance of tomato plants.

1.4 Research Benefits

Findings in this study are important from the point of view of environmental pollution likely to be caused while using chemical nematicides to control root-knot nematodes in tomato plants. The future prospects looks bright for identifying endophytic fungi to replace the synthetic dangerous and expensive chemicals used at present.
EXPERIMENT 1
Exploration of endophytic
- Isolation of endophytic fungi.
- Identification
- Diversity index analysis
- Similarity analysis
- Pathogenicity test

EXPERIMENT 2
Colonisation test

EXPERIMENT 3 and 4
*In planta* test to evaluate the effect of endophytic fungi on root-knot nematodes as well as their effect on plant growth promotion.

EXPERIMENT 5
*In vitro* test to evaluate the effect of endophytic fungi culture filtrate on root-knot nematode juvenile mortality rate.

Figure 1. Flow chart diagram on the steps followed in this research