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*Short Communication*

# Endophytic *Fusarium* spp. from wild banana (*Musa acuminata*) roots

**Latiffah Zakaria[1,2]* and Nur Hidayah Abdul Rahman[1]**

[1]School of Biological Sciences, Universiti Sains Malaysia, 11800 USM, Pulau Pinang, Malaysia. [2]Centre of Marine and Coastal Studies, Universiti Sains Malaysia (CEMACS-Mukahead), 11800 USM, Pulau Pinang, Malaysia.

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**Endophytic *Fusarium* species were isolated from roots of wild banana (*Musa acuminata*) collected randomly in several locations in Penang Island, Malaysia. A total of 54 isolates of *Fusarium* were recovered from 100 root fragments. Based on morphological features of macroconidia, microconidia and conidiogenous cells, three *Fusarium* species were identified in which the most common species was *F. oxysporum* (41.5%) followed by *F. solani* (32.1%) and *F. semitectum* (24.5%). The present study showed that there are diverse endophytic *Fusarium* species in the roots of wild banana and has the potential to be used as biological control agents.**

**Key words:** Endophyte, *Fusarium*, root, wild banana.

## INTRODUCTION

Endophytic fungi live inside healthy plant tissues without causing any diseases or apparent damages to the host which indicated that many endophytic fungi form mutually beneficial relationships with their host plant (Petrini et al., 1992; Lodge et al., 1996). In the mutualistic association, the host plants are protected from pest and pathogenic fungi and in return, the host plant provided nutrition to the fungi (Azevedo et al., 2000; Saikkonen et al., 2004). Other definition of endophytic fungi includes symptomless latent pathogen which inhabiting plant tissues at some time in their life cycle without causing apparent harm to the host (Petrini, 1991).

Endophytic *Fusarium* species have been recovered from many types of plants such as Araceae, Bromeliaceae, Orchidaceae (Petrini and Dreyfuss, 1981), Palmae (Rodrigues, 1994) and Compositae (Fisher et al., 1995) including Musaceae. Therefore, endophytic *Fusarium* species are abundant and distributed widely in different types of plant.

The present study was conducted to isolate and to identify endophytic *Fusarium* species from roots of wild banana (*Musa acuminata*). We wanted to gather information on the occurrence and diversity of *Fusarium* species as endophytic species of *Fusarium* is less studied.

## MATERIALS AND METHODS

### Isolation and identification of Endophytic *Fusarium*

Symptomless wild banana (*Musa acuminata*) roots were randomly sampled along Paya Terubong and Balik Pulau roads, Penang Island, Malaysia. The roots were collected from nine young and healthy wild banana trees, kept in plastic bags and brought to the laboratory for further analysis. The roots were then washed under running tap water for 24 h to thoroughly clean the root samples.

The roots were cut about 1 to 1.5 cm fragments and surface sterilized in 75% ethanol for 1 min followed by 1% sodium hypochlorite for 3 min and 95% ethanol for 5 min. The samples were then dried using sterilized filter paper.

For isolation of endophytic *Fusarium* isolates, 100 root fragments were plated onto peptone chloro-nitro benzene (PCNB) medium, a semi-selective medium for isolation of *Fusarium* species. The plates were incubated at room temperature (25±1°C) until visible growth of mycelium from the root fragments was observed. The mycelium was subsequently sub-cultured onto fresh PDA plates to obtain pure culture.

For identification, mycelium was grown on carnation leaf-piece agar (CLA) and microscopic and macroscopic structures such as size and shape of microconidia, shape, size, number of septa, shape of apical and basal cells of macroconidia, conidiogenous cells (monophialide and polyphialide) and presence of chlamydospores were observed (Summerell et al., 2003). Species descriptions in The *Fusarium* Laboratory Manual (Leslie and

*Corresponding author. E-mail: Lfah@usm.my. Tel: 04 – 6533506. Fax: 04 – 6565125.

Summerell, 2006) were used for identification of the endophytic *Fusarium* spp.

The efficiency of surface sterilization method for isolation of endophytic fungi was determined for each tissues using imprint method as described by Schulz et al. (1993).

## RESULTS AND DISCUSSION

Fifty-four isolates of endophytic *Fusarium* isolates were recovered from the root fragments. No fungal growth was observed on the imprint plates which showed the effectiveness of the surface-sterilization method. Based on morphological characteristics, three *Fusarium* species were identified namely, *F. oxysporum* (41.5%) followed by *F. solani* (32.1%) and *F. semitectum* (24.5%).

Isolation of endophytic *Fusarium* species from wild banana was reported by Photita et al. (2001) and Cao et al. (2002). Three *Fusarium* species designated as *Fusarium* sp. 1, *Fusarium* sp. 2 and *Fusarium* sp. 4 were isolated from young and old leaf tissues of wild banana in Thailand (Photita et al., 2001). *Fusarium* sp. was among the fungal flora isolated from roots of wild banana in South China, comprising 10% of total endophytic fungi recovered from healthy root tissues (Cao et al., 2002). In addition to root tissues, *Fusarium* sp. has been isolated from banana leaves of mature wild banana from different localities in Sao Paulo, Brazil (Pereira et al., 1993).

In the present study, the most common species recovered from the root tissues of wild banana was *F. oxysporum* followed by *F. solani*. Both species have been isolated from healthy roots of Cavendish banana with *F. oxysporum* as the most dominant species recovered from the roots (Athman, 2006). *F. solani* was also recovered from healthy leaf pieces of *Musa* spp. in Hong Kong and south east Queensland (Brown et al., 1998).

In addition to *F. oxysporum* and *F. solani*, *F. semitectum* was also isolated from healthy roots of wild banana. Isolates of *F. semitectum* has been reported to be the most dominant *Fusarium* species recovered from healthy rhizomes of banana CV Pisang Awak (Niere, 2001).

*Fusarium oxysporum* and *F. solani* are well-known plant pathogens, infecting wide range of crops including banana plants. *Fusarium oxysporum* f.sp *cubense* is the causal agent of Fusarium wilt or Panama disease and *F. solani* (teleomorph *Nectria haematococca*) caused root rot of banana. *Fusarium semitectum* is associated with causing crown rot of banana (Marin et al., 1996; Knight et al., 2008). In the present study, it is not possible to suggest that the endophytic *Fusarium* species from the wild banana roots are pathogenic or non-pathogenic. Pathogenicity tests are required to confirm pathogenicity of the species on banana plants.

Fungal endophytes have been proposed as potential biological control agents (Brown et al., 1998). Endophytic *F. oxysporum* isolates have been tested to suppress growth of *F. oxysporum* f.sp. *cubense* (Nel et al., 2006). In another study, endophytic *F. oxysporum* reduced nematode numbers and weevil damage on banana and enhance banana plant growth in the presence of nematode infestation (Paparu et al., 2009). Endophytic *F. semitectum* has been used as biocontrol of ergot on pearl millet by reducing sclerotia formation and development (Rao and Thakur 1988). McFarlane and Rutherford (2005) reported that based on *in-vitro* study, endophytic *F. sacchari* from sugarcane inhibit the development of sugarcane borer moth. Thus, the potential of using endophytic *Fusarium* species as biological control agents of pest and diseases is promising and requires further studies.

The present study demonstrated that similar with other studies, endophytic *Fusarium* species were recovered from roots of wild banana and three *Fusarium* species were identified namely, *F. oxysporum* (41.5%) followed by *F. solani* (32.1%) and *F. semitectum* (24.5%).

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