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SHORT COMMUNICATION

Fusarium species in forest soil of Bird Valley

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ABSTRACT

Fusarium species were isolated from seven sites in Bird Valley, a forested area in Universiti Sains Malaysia, Pulau Pinang, Malaysia. A total of 59 *Fusarium* isolates were recovered in which two species were identified namely, *F. solani* and *F. oxsporum*. The most prevalent species was *F. solani* (84.7%) and *F. oxysporum* comprised 15.3%. The present study showed that only two species of *Fusarium* were identified in forest soil of Bird Valley.

Keywords: *Fusarium*, forest soil

INTRODUCTION

Fusarium species are widely distributed in a variety of soil types and are mostly associated with organic matter, plant debris and plant roots (Burgess, 1981). In cultivated soils, majority of *Fusarium* species occur in plant debris and plant roots, and can either be parasite or saprophyte (Smith, 1967; Burgess, 1981). Unlike cultivated soils, the occurrences of *Fusarium* species in uncultivated soils were not as diverse as in cultivated soils. The present study was conducted to determine the occurrences of *Fusarium* species in Bird Valley or 'Lurah Burung', a forested area in Universiti Sains Malaysia (USM), Minden, Pulau Pinang, Malaysia.

MATERIALS AND METHODS

Soil samples were collected from eight different sites representing different microhabitats within Bird Valley (also known as Durian Valley), a forested area located at the east side of USM main campus, Minden, Pulau Pinang (Table 1). Two samples were collected from each site.

Soil dilution plate was used to isolate *Fusarium* species from the soils. The soils were taken from a depth of 10 – 12 cm and stored in paper bags. After air-dried at room temperature (27 ± 1 °C) for 24 – 48 h, the soils were ground in a mortar. A 1 g of the soils were suspended in 100 mL of sterile distilled water and mixed thoroughly. One mL of the soil suspension was used to prepare a dilution series of 10^{-2} and 10^{-3} and 1 mL of each dilution series was uniformly dispensed onto peptone chloro-nitro benzene (PCNB) media, with four replicates. The PCNB plates were incubated at room temperature (27 ± 1 °C) for 4 – 7 days or until visible sign of colony growth. The colonies formed on PCNB were transferred onto potato sucrose agar (PSA). The media used for identification and morphological descriptions of *Fusarium* species were according to the description by Nelson *et al*. (1983).

The soil samples were also analyzed for their pH and texture. Soil texture was determined using feel method (Brady and Weil, 1999). Soil pH was measured by weighing 30 g of soils and mixed in 50 mL of water. The mixture was shaken for 2 h and pH value was measured.

Table 1: The site and vegetation of soil samples collected in Bird Valley

Site	Description
A	Closed canopy
B	Open canopy
C	*Cariota mitis* tree (Palmae family)
D	Area without any vegetation
E	Shrub
F	Grassy area (at the edge of Bird Valley)
G	*Pterocarpus indicus* tree
H	Near rotting trunks

RESULTS

A total of 59 *Fusarium* isolates were recovered from seven soil samples from different sites in Bird Valley. *Fusarium* isolates were not recovered from site D soil sample i.e. an area without any vegetation. Based on morphological description by Nelson *et al*. (1983), two species were identified namely, *F. solani* (84.7%) and *F. oxysporum* (15.3%). *F. solani* isolates were recovered from all seven sites, and *F. oxysporum* isolates from sites B, F, G and H. The *Fusarium* species successfully isolated, the soil texture and pH are shown in Table 2.

Fusarium solani and *F. oxysporum* were presence in soils with acidic condition with pH ranging from 3.56 – 4.26. The soil texture varied from sandy loam to sandy clay loam.

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Table 2: Characteristics of soils samples from Bird Valley and *Fusarium* species isolated

Site	Vegetation	Texture	pH	*Fusarium* species
A	closed canopy	sandy clay loam	4.26	*F. solani*
B	open canopy	sandy loam	4.21	*F. solani*
				F. oxysporum
C	*Cariota mitis* tree (Palmae family)	sandy loam	3.50	*F. solani*
D	area without any vegetation	clay loam	3.56	None isolated
E	shrub	sandy loam	3.84	*F. solani*
F	grassy area (at the edge of Bird Valley)	sandy loam	3.56	*F. solani*
				F. oxysporum
G	*Pterocarpus indicus* tree	sandy loam	3.57	*F. solani*
				F. oxysporum
H	near rotting trunks	sandy loam	3.59	*F. solani*
				F. oxysporum

DISCUSSION

Only two *Fusarium* species were isolated from Bird Valley, a forested area in USM, main campus, Pulau Pinang. The present study was in accordance with a study by Smith (1967) who reported that *Fusarium* species may be difficult to become established in forest land; and a study by Lim (1974) in which field and forest soils yielded less fusaria compared to cultivated soils. Generally, uncultivated soils such as forest soil, the diversity and occurrences of *Fusarium* species was low compared to cultivated soils. In cultivated soils, *Fusarium* species were more prevalent and associated with plant debris (Burgess, 1981).

Fusarium solani was more prevalent in the forested area and was recovered from seven sites with different vegetations. The results from this study contrasted with the results from Lim and Chew (1970) in which they reported that *Fusarium* species were not recovered from three forest reserves in Singapore. *Fusarium solani* is one of the most common *Fusarium* species distributed in the soils and have been isolated from numerous soil samples in sub-tropical, semi-arid and grassland soils (Burgess and Summerell, 1992). *Fusarium solani* is also the most common species isolated from cultivated soils (Lim and Chew, 1972; Latiffah *et al*., 2007) and from sandy soils (Sanquis and Borba, 1997).

The occurrence of *F. oxysporum* was smaller and was recovered from fewer sites. *Fusarium oxysporum* is a well-known plant pathogen and is common in various types of soil. However, many isolates of *F. oxysporum* from soils are also considered to be non-pathogenic (Gordon and Okamoto, 1992). Low percentage occurrences of *F. oxysporum* could be attributed to the soil type and vegetation as *F. oxysporum* is commonly associated with plant debris and can survive in the soil as active hyphae in plant debris especially in cultivated soils (Burgess, 1981).

Microbial communities in soil are largely influence by the soil type. Most of the soil type in Bird Valley was sandy loam soil which has lower water holding capacity. Therefore, sandy soil types may not have enough water content to support *Fusarium* growth although the acidic condition is suitable for fungal growth.

In conclusion, only two *Fusarium* species, *F. solani* and *F. oxysporum* were recovered from several sites in Bird Valley, a forested area in USM main campus. The present study showed that unlike cultivated soils, *Fusarium* species are not diverse in forest soil in Bird Valley.

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