UNIVERSITI TEKNOLOGI MARA

DIVERSITY OF PEAT SOIL AND ANTIMICROBIAL ACTIVITIES OF FILAMENTOUS FUNGI FROM KUALA LANGAT, SELANGOR

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ABSTRACT

A total of 106 fungal isolates were isolated from peat soil samples collected at three different sites of Kuala Langat district namely Felcra Sijangkang, Pulau Carey and Pulau Kempas. The soil sampling involved three different depths which are top soil (0 to 30 cm), midway between top soil and water table (30 to 60 cm), and water table (60 to 90 cm). This study is focused on the diversity of peat soil filamentous fungi in Selangor and their antimicrobial potentials. The soil fungi were isolated by direct isolation and soil dilution techniques. The identification of these isolates then determined by integrating the conventional microscope as well as molecular approach. Based on morphological characteristics, seven genera of filamentous fungi were identified namely, *Aspergillus* sp., *Penicillium* sp., *Trichoderma* sp., *Talaromyces* sp., *Neosartorya* sp., *Paecilomyces* sp., and *Curvularia* sp. The ribosomal internal transcribed spacer (ITS) region was applied for species determination of fungal communities because of its high degree of variation between related species. Out of 106 isolates from all three sampling sites, the most abundant fungi isolated was found to be *Penicillium* sp. with 22 isolates out of 77 identified fungal isolates, followed by *Aspergillus* sp. with 14 isolates, *Trichoderma* sp. with 12 isolates, *Neosartorya* sp. with 12 isolates and *Talaromyces* sp. with 10 isolates. These fungal isolates were then subjected to screening of their antimicrobial potentials against selected common bacterial and yeast strains. Positive results from this antimicrobial assays were further analysed by phylogenetic tree analysis to understand the relationship among fungal taxa involved. The results from this study have demonstrated that some peat soils in Selangor can be considered as valuable natural sources of filamentous fungi which having potent biological activities that can be exploited as antibacterial and antifungal. Since peat soil is important as major carbon storage but little is known of their ecology and microbial diversity, the interest in studying filamentous fungi isolated from this type of soil has increased.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

For a long time, soil is known to be the storehouse for a wide variety of organisms from all life domains. Interest in the microbial diversity has emerged due to its critical function in maintaining and controlling the quality of the soil. Peat soil ecosystems are found to be the best reservoir for the three domains systems (bacteria, archae and eukaryote) that include fungi, animals and plants (Nuyim et al., 2000). Peat can be defined as an organic soil having mineral content that is not exceeding 35% where it basically comprises of plant materials that are partially decomposed in addition of mineral fractions such as silt, clay and sand. Peat soil area with depth of 0.5 m and more has been classified into two which are shallow peat soil (with organic matter depth less than 0.45 m) and deep peat soil (with organic matter depth more than 0.5 m) (Morison et al., 2010). Since peat soil is important as major carbon storage but little is known of their ecology and microbial diversity, the interest in studying microorganisms isolated from this type of soil has increased.

Peat lands, in their natural state are high in moisture content as the soil surface is usually highly saturated with the ground water. Peat soils usually soft, organic and are made up of rotting plant materials. Organic soils are low bulk density thus causing it to become soggy. Malaysia is rich in lowland peat areas that are usually flooded and swampy. These peat areas were initially untouched and not used for farming, but eventually found to be feasible for the planting of sago palms and oil palms. Malaysian peat soils are categorized as tropical peat and have not been well studied. Factors of peat formation in the temperate areas are different from that in tropical areas and the peat will be morpho-genetically different (Paramanathan, 2008, Yew et al., 2010). Temperate deposits are derived from bryophytes, and small shrubs, while tropical deposits derived from various tree species, with root penetration that were up to several meters (Wűst, 2003). Malaysia confirms that tropical peat is indeed different from temperate peat as many of the tropical peat containing wood materials in the soil layers (Veloo et al., 2014).

There are three stages of decomposition that differentiate tropical peat materials which are sapric, hemic and fibric. Sapric is the highest stage of decomposition, followed