UNIVERSITI PUTRA MALAYSIA

CHARACTERIZATION, REPRODUCTION, AND PATHOGENICITY OF *MARASMIELLUS PALMIVORUS* (SHARPLES) DESJARDIN (COMB. PROV.) OF OIL PALM IN PENINSULAR MALAYSIA

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By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirement for the Degree of Master of Science

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Agricultural Science

CHARACTERIZATION, REPRODUCTION, AND PATHOGENICITY OF *MARASMIELLUS PALMIVORUS* (SHARPLES) DESJARDIN (COMB. PROV.) OF OIL PALM IN PENINSULAR MALAYSIA

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September 2013

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Oil palm (*Elaeis guineensis*) is an economically very important plantation crop in Malaysia. However, it is susceptible to various diseases including bunch rot causing severe losses and damage to oil palm fruit bunches. The causal agent previously identified to be *Marasmiellus palmivorus* has not been published well in literature. There is no description of the morphology and information on reproduction and pathogenicity of the species found in local oil palm plantations in Malaysia. Knowledge on the reproduction and pathogenicity is essential to facilitate further detailed study of this fungus. Rhizomorphs and basidiocarps found on dead fruits, fronds or trunks of oil palm were randomly sampled from plantations located in the states of Perak and Selangor. The fungus was isolated and repeatedly subcultured on Malt Extract Agar (MEA) to obtain pure culture. Hyphae were septate and found to produce clamp connections under light and scanning electron microscopy.

Diameter of pileus was in the range of 0.5-2cm, stipe length ranged from 1-3.2cm. Each pileus was slightly depressed at the center, smooth, convex, with involute margin, orange-white fading to white and possess a central, solid, tough, cylindrical, overall whitish stipe. The gills were adnate, distant and have a non-distinctive odour. All isolates grew optimumly at the range of 25-30°C and pH range of 5.0-6.0 on MEA indicating that *Marasmiellus palmivorus* was a mesophile. Mycelial interaction test showed that isolates found were from three different mating types: Teluk Intan (Perak), Bangi (Selangor) and Serdang (Selangor). Induction of basidiocarps using wheat spawn was carried out in a moist growth chamber in a complete randomized design (CRD), with treatments of 12 hours of alternate white light and darkness contributed to fructifications on oil palm empty fruit bunch fibres substrates. Empty fruit bunch fibres substrates yielded better quality of basidiocarps with mean of 22 basidiocarps, mean diameter of pileus 2.7cm and mean length of stipe 0.6cm. Morphology of induced basidiocarps was similar to naturally produced fruit bodies. White spore prints were obtained. Average discharge of ellipsoid basidiospores per basidiocarp was 3.29 x 10^4 spores per milliliter (ml). Spores were viable with size of 6.2-8.7µm, 80-85% germination and germ tubes ranging from 64.3-82.5µm after 24 hours incubation at ambient temperature on water agar. Pathogenicity test of six representative isolates showed that *M. palmivorus* was able to cause necrotic lesions on wounded leaves of oil palm seedlings with disease incidence reaching up to 33-55%.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Sarjana Sains Pertanian

PENCIRIAN, PEMBIAKAN, DAN KEPATOGENAN *MARASMIELLUS PALMIVORUS* (SHARPLES) DESJARDIN (COMB. PROV.) KELAPA SAWIT DI SEMENANJUNG MALAYSIA

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Kelapa sawit (*Elaeis guineensis*) adalah sejenis tanaman kontan yang sangat penting di Malaysia. Walau bagaimanapun, ia terdedah kepada pelbagai jenis penyakit termasuk reput tandan yang menyebabkan kerugian yang serius dan kerosakan pada tandan kelapa sawit. Agen penyebab *Marasmiellus palmivorus* yang dikenalpasti sebelum ini tidak ditulis dengan baik dalam penerbitan. Tiada penerangan mengenai morfologi dan maklumat tentang pembiakan dan kepatogenan spesies yang didapati di ladang kelapa sawit di Malaysia. Pengetahuan pada pembiakan dan kepatogenan adalah penting untuk memudahkan lagi kajian terperinci kulat ini. Rizomof dan basidiokarpa yang terdapat pada buah mati, pelepah atau batang pokok kelapa sawit disampel secara rawak dari ladang di negeri Perak dan Selangor. Kulat ini dipencilkan dan dikulturkan secara berkali-kali untuk mendapat kultur tulen pada agar ekstrak malta. Hifa bersepta dan

menghasilkan penyambung cengkam di bawah mikroskop cahaya dan imbasan electron. Diameter pileus adalah di antara 0.5-2sm, panjang batang di antara 1-3.2sm. Setiap pileus adalah tertekan sedikit pada bahagian pusat, licin, cembung, bergaris rumit, jingga-putih meluntur kepada putih dan berbatang pusat, padat, teguh, bersilinder, dan keseluruhannya putih. Insangnya adnat, berjarak dan tidak berbau tersendiri. Semua pencilan tumbuh secara optimum di antara 25-30°C dan pH 5.0-6.0 pada agar ekstrak malta menunjukkan bahawa *Marasmiellus palmivorus* ialah mesofil. Ujian interaksi miselia menunjukkan bahawa pencilan yang terdapat adalah daripada tiga jenis kacukan yang berlainan: Teluk Intan (Perak), Bangi (Selangor) dan Serdang (Selangor). Pengaruhan basidiokarpa menggunakan pembenihan pada gandum dijalankan di dalam sebuah kebuk pertumbuhan lembap dalam rekabentuk rawak lengkap (CRD), dengan rawatan cahaya putih berganti selama 12 jam dan kegelapan menyumbang kepada pembuahan pada substrat buah tandan kosong kelapa sawit. Substrat buah tandan kosong menghasilkan purata 22 basidiokarpa, diameter purata pileus 2.7sm dan panjang purata batang 0.6sm. Morfologi basidiokarpa teraruh dan semula jadi adalah sama. Tapak spora telah diperolehi. Purata pembebasan basidiospora yang berbentuk elips bagi setiap basidiokarpa ialah 3.29 x 10^4 spora per mililiter (ml). Spora adalah bernas dengan saiz 6.2-8.7µm, percambahan 80-85% dan panjang tiub germa 64.3-82.5µm selepas pengeraman 24 jam pada suhu ambien di atas agar air. Ujian kepatogenan bagi enam pencilan menunjukkan bahawa *M. palmivorus* adalah berupaya menyebabkan kecederaan nekrotik pada daun anak benih kelapa sawit yang luka dengan pencapaian insiden penyakit 33-55%.

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I certify that a Thesis Examination Committee has met on 6 September 2013 conduct the final examination of Pong Vui Mei on her thesis entitled "Characterization, Reproduction, and Pathogenicity of *Marasmiellus palmivorus* (Sharples) Desjardin (comb. prov.) of Oil Palm in Peninsular Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

_____

PONG VUI MEI

Date: 6 September 2013

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