



UNIVERSITI PUTRA MALAYSIA

**EFFECT OF DIFFERENT INCUBATION PERIOD ON MICROBIAL
BIOMASS CARBON (C) LEVEL IN TWO SOIL SERIES**

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By

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A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia in
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FACULTY OF AGRICULTURE

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CERTIFICATION

This project report entitled “Different Incubation Period Of Microbial Biomass Carbon for Two Soil Series” is prepared by Mohd Nizar Bin Che jamil and submitted to the Faculty Of Agriculture in fulfilment of the requirement of the Research project (PRT 499) for award of degree of Bachelor Of Agricultural Science.

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ABSTRACT

A study on effect of different incubation period on the level of microbial biomass carbon (C) in two soil series was carried out in open-land at Putrajaya (Prang Series) and University Agriculture Park (TPU), Puchong, Selangor (Serdang Series). Serdang soil series was taken at Universiti Agriculture Park while Prang series was taken at Putrajaya. 100 m² plot was established at each site where about 10 soil samples were collected at the depth of 0-20 cm depth to form a composite sample. Five replicates were made out of the composite sample for each plot. The physical and chemical properties analyzed in this study include soil texture, bulk density, soil acidity (pH), electrical conductivity (EC) and soil organic carbon (SOC). The fresh soil samples were kept chilled in chiller at 4°C prior for analysis of microbial biomass carbon (C). Both soil series exhibit clay soil texture, where Serdang series soil has slightly higher amount of sand fraction and lower amount of clay compared to Prang series soil. Higher moisture and organic carbon also act as predisposing factor that enhances higher growth of microbial biomass C in Serdang soil. The Serdang soil series soil samples can be subjected to dichromate digestion after 1st or 2nd day of incubation. In contrast, Prang series required a period of 2 days or 4 days to ideal amount of microbial biomass C prior for dichromate digestion. Further investigation on wider number of soil series need to be carried out. The results obtained would be beneficial in modifying the chloroform fumigation extraction and incubation timing as it can help in reducing the amount of time taken.

ABSTRAK

Satu kajian berkenaan kesan terhadap perbezaan tempoh inkubasi mikrobial biomas karbon pada dua siri tanah yang berbeza telah dijalankan. Kajian telah dijalankan di kawasan terpilih di Putrajaya dan Taman Pertanian Universiti, Puchong dan tanah siri Serdang diambil di Taman Pertanian Universiti manakala tanah siri Prang diambil di Putrajaya. 100m² plot telah ditentukan dimana 10 sampel dikutip pada kedalaman 0-20 cm untuk membentuk sampel komposit. Lima replikasi telah dibuat dari sampel komposit untuk setiap plot. Ciri fizikal dan kimia tanah yang digunakan dalam kajian ini tekstur tanah, ketumpatan pukal, keasidan tanah (pH), EC, kelembapan tanah, dan kandungan organik tanah. Sampel tanah segar disimpan didalam penyejuk pada suhu 4°C bagi tujuan analisis untuk mikrobial biomas karbon. Kedua-dua tanah menunjukkan struktur tanah liat manakala tanah siri Serdang mengandungi kandungan pasir yang lebih tinggi berbanding tanah siri Prang. Kelembapan tanah dan kandungan organik karbon tanah yang tinggi bertindak sebagai faktor penguraian yang meningkatkan pertumbuhan mikrob biomas C bagi tanah siri Serdang. Penghadaman dikromat boleh dilakukan pada tanah siri Serdang selepas hari pertama dan kedua inkubasi manakala bagi tanah siri Prang sesuai dilakukan pada hari kedua atau keempat inkubasi bagi mendapatkan bilangan mikrob biomas karbon yang ideal. Kajian yang berterusan terhadap pelbagai siri tanah perlu dilakukan bagi mendapatkan maklumat yang lengkap tentang kandungan mikrob biomas karbon. Keputusan yang diperolehi amat penting dan bermakna dalam mengubah mengubah suai teknik pengekstrakan kloroform pengasapan dan tempoh masa inkubasi kerana ia boleh membantu dalam mengurangkan jumlah masa yang digunakan.

CHAPTER 1

INTRODUCTION

1.1 General

Microbial biomass can be defined as part of the organism matter in the soil that consist of microorganism that vary in size between 5-10 μm^3 which decompose organic matters and crops residue such as fallen tree branch, leaves and trees. O'Donnel et al. (2007) stated that soil microbial biomass through the process of mineralization and immobilization controls the flow of the carbon, nitrogen and phosphorus in terrestrial ecosystem. Up to 5% of the total organic carbon and nitrogen in soil is contained in the microbial biomass at a time and when microorganism died, all of these nutrients will be released in forms that can be readily taken by plant. Christensen (1996) stated that, agricultural management influences soil microorganisms and soil microbial process through changes in the quantity and quality of the plant residue entering the soil. Most of Malaysian soils are from seven of the 12 orders, namely Alfisols, Entisols, Inceptisols, Histosols, Spodosols, Ultisols and Oxisols. Shamshuddin & Fauziah (2010) found that 72% of lands in Malaysia are of Ultisols and Oxisols. Most of the Ultisols and Oxisols in the tropics lack organic matter which can supply plant nutrients as well as improve the structure of mineralised soils (Shamshuddin *et al.* , 2011).

Microbial biomass can be defined as the amount of microbial available in a soil at a given time (Brookes, 1995). Microbial biomass evaluation is found to be one of the most effective way to evaluate the current quality of fertility of a land, especially in agricultural land (Schloter *et al.*, 2003). Several methods are used to determine the level of the microbial biomass in the soil which includes fumigation-incubation,

fumigation-extraction, and the substrate-induced respiration methods. Among all those method mentioned, the most favourable method is chloroform fumigation-extraction method by (Setia *et al.*, 2012). The amount of soil samples needed to be incubated also varied based on the type of soil collected. Furthermore, many scientific studies on microbial biomass implements different incubation spatial. The technique might not be suitable if large samples are used and many areas need to be evaluate in a shorter time.

1.2 Problem Statement

Study on the effect of difference period of incubation of microbial biomass on difference soil series is still lacking, especially in Malaysia. Our countries have more than 100 soil series across the nation, and it will give us a great view on the distribution of the microbial biomass in different soil series. Furthermore, suitable incubation period can be a good reference for future studies of the microbial biomass in soil

Objectives:

1. To determine the effect of different incubation period on the growth of microbial biomass carbon in Serdang and Prang series.
2. To evaluate the influence of the incubation period on microbial biomass C in two soil series.

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