COMPOSTING PERIOD OF OIL PALM EMPTY FRUIT BUNCH (EFB) SUITABLE AS SUBSTRATE FOR VOLVARIELLA VOLVACEA MUSHROOM PRODUCTION

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COMPOSTING PERIOD OF OIL PALM EMPTY FRUIT BUNCH (EFB) SUITABLE AS SUBSTRATE FOR *VOLVARIELLA VOLVACEA* MUSHROOM PRODUCTION

By

MOHAMAD HAZIM BIN ISMAIL

A Project Report Submitted in Partial Fulfillment of the Requirements for the Degree of Bachelor in Wood Science and Technology in The Faculty of Forestry
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DEDICATION

Special thanks to

My beloved family especially my father and mother,

Ismail bin Zakaria and Hamimah binti Md Nor,

My siblings and to all my friends for their helping hands, support and guidance,

Thank you and May Allah bless us all

ABSTRACT

Mushroom has been considered as a vital food resource and has been regards to have many medicinal properties that can help to boost the human health and act as alternative food resource in some area of the world. The cultivation of the mushroom has been intensive and many methods have been discovered to increase the yield of the mushroom. In Malaysia, the cultivation of *V. volvacea* are done using palm oil empty fruit bunch (EFB) as the substrate. The research objective is to determine the effect of composting period on *V. volvacea* mushroom production and determine the suitable composting condition. This research was carried out in Hutan Simpan Ayer Hitam located at Puchong, Selangor. The *V. volvacea* was grown on the EFB bed with respective composting period, 6, 9 and 12 day. The microclimate data was recorded during 6, 9 and 12 days composting period. Then, the mushroom yield was observed and recorded for 30 days period of harvesting. This research found that different composting period did not have significant impact on the production of mushroom in terms of weight and number of mushroom produced during harvesting. In conclusion, the composting period 6, 9 and 12 days achieved suitable condition of temperature, pH and moisture content for the microorganism to thrive and provide suitable compost for the mushroom to grow.

ABSTRAK

Cendawan dianggap sebagai sumber makanan yang penting dan mempunyai banyak sifat perubatan yang boleh membantu meningkatkan kesihatan manusia dan bertindak sebagai sumber makanan alternatif di beberapa kawasan di dunia. Penanaman cendawan telah dilakukan secara intensif dan pelbagai kaedah telah ditemui untuk meningkatkan hasil cendawan. Di Malaysia, penanaman *V. volvacea* dilakukan dengan menggunakan tandan kelapa sawit kosong sebagai substrat. Objektif penyelidikan adalah untuk menentukan kesan masa pengkomposan terhadap pengeluaran *V. volvacea* dan menentukan keadaan pengkomposan yang optimum. Kajian ini dijalankan di Hutan Simpan Ayer Hitam yang terletak di Puchong, Selangor. *V. volvacea* ditanam di atas batas tandan kelapa sawit kosong dengan tempoh kompos mengikut tempoh hari tertentu iaitu selama 6, 9 dan 12 hari. Data mikroklimat telah direkodkan dalam tempoh 6, 9 dan 12 hari kompos. Kemudian, hasil cendawan diperhatikan dan direkodkan selama 30 hari menuai. Kajian ini mendapati bahawa tempoh pengkomposan yang berbeza tidak mempunyai kesan yang ketara ke atas penghasilan cendawan dari segi berat dan bilangan cendawan yang dihasilkan semasa penuaian. Sebagai kesimpulan, tempoh pengkomposan 6, 9 dan 12 hari mencapai keadaan yang sesuai bagi suhu, pH dan kandungan lembapan untuk mikroorganisma berkembang dan menyediakan kompos yang sesuai untuk pertumbuhan cendawan.

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APPROVAL SHEET

I certify that this research project entitled 'Composting Period Of Oil Palm Empty Fruit Bunch (EFB) Suitable As Substrate For *Volvariella volvacea* Mushroom Production' by Mohamad Hazim Bin Ismail has been examined and approved as a partial fulfilment of the requirement for the degree of Bachelor of Wood Science and Technology in the Faculty of Forestry, Universiti Putra Malaysia.

_____

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LIST OF ABBREVIATION

H_2O	Water
O^2	Oxygen
km^2	Kilometer Squared
m^3	Meter Cubic
℃	Celsius
CO	Carbon Monoxide
EFB	Empty Fruit Bunch
FFB	Fresh Fruit Bunch
g	Gram
Kg	Kilogram
LUX	Luminous Flux
pH	Potential Hydrogen
POME	Palm Oil Mill Effluent
ppm	Parts Per Million
RH	Relative Humidity

CHAPTER 1

INTRODUCTION

1.1 Background

Volvariella volvacea or commonly known as paddy straw mushroom is one of the common mushrooms to cultivate in South-East Asia and this have been proven by many countries in this region such as Philippines, Thailand, Indonesia and Vietnam. The popularity of this mushroom started in China where it is one of the famous edible mushrooms that people can cultivate. The reason behind this is how the paddy straw mushroom can be cultivated. The paddy straw mushroom can be cultivated easily within 14 days of incubation depending on preparation of the composting substrate. The paddy straw mushroom is a mushroom that thrives best at 30-35°C for its mycelial development (Reyes, 2000).

The paddy straw mushroom can easily grow in any composting biomass such as paddy straw, cotton, animal manure or an oil palm empty fruit bunch (EFB). In Malaysia, this paddy straw mushroom can be found naturally in the oil palm plantation as they grow naturally on the oil palm EFB and this has pose a significant reason to cultivate and commercialize this mushroom as it has potential to be a reliable source of income.

Malaysia is known as one of the largest producers of palm oil after Indonesia (Varqa, 2017). With a large span of plantation covering almost a total area of 50,000 km², a total of 423 palm oil mills are operating in Malaysia. In 2011, a total of about 92.9 million tons of fresh fruit bunches (FFB) were harvested and processed in the palm oil mills, resulting in the generation of about 44

million ton of solid oil palm residues and 62 million tons of palm oil mill effluent during the palm oil extraction. The solid oil palm residue is a biomass consisting of, by wet weight, 23.8 million tons (54%) of empty fruit bunch (EFB), 13.2 million tons (30%) of shell, and 7.9 million tons (18%) of fiber (Chiew & Shimada, 2013). This resulting in an abundance of waste biomass especially the oil palm EFB and become a problem for the palm oil company.

Many solutions have been taken to reduce or recycle the oil palm EFB include incinerating it to produce heat for the boiler to generate electricity, and fertilizer for the crop and others. But the solution proof to be inefficient to reduce massive quantity of the oil palm EFB. Solution such as incinerating creates more problem as the burning of the oil palm EFB generates ashes that pollute the air quality.

Meanwhile, some smallholders in Malaysia are trying to cultivate the paddy straw mushroom by themselves using EFB, but the success rate is below the expectation due to most of them try to cultivate based on their own observation and experience but the method has its own limitation. To ensure that the cultivation of this mushroom run efficiently, the smallholders should find out the optimum composting condition of EFB for paddy straw mushroom production.

Factors that might affect composting condition include environmental attributes such as microclimate (temperature and moisture content) and composting parameter that might promote adequate EFB substrate composting prior to paddy straw mushroom cultivation. Although the paddy straw mushroom can be cultivated easily on oil palm EFB, different area of

cultivation can result in different yield, it is vital that the suitable condition for cultivating this mushroom for high yield recovery and at the same time to promote efficient use of EFB.

1.2 Problem Statement

Many researches have reported on the cultivation of *V. volvacea* mushroom using banana leaves (Belewu & Belewu, 2005), dry straw (Reyes, 2000), cotton waste, sugarcane trash, maize stubbles/trash and rice straw (Thiribhuvanamala et al., 2012) and others. Most of the research focused on the suitability compost substrate for the cultivation of *V.volvacea* with some of the researcher mixing the biomass with chemical solution to increase its potency.

Using oil palm EFB as a composting substrate is still new to the cultivation of this mushroom. Rauf (2017) reported the cultivation of this mushroom using oil palm EFB as a composting substrate and comparing different time of composting periods. Optimum composting period resulting from the research is 12 days of composting with the highest yield of production of mushroom was obtained. However, the research only compares the amount of composting day without taking measurement on the environmental data during composting such as microclimatic factor or other factor that may affect the mushroom production.

In this research, the microclimatic parameter such as environment temperature and EFB substrate conditions (temperature, pH, and moisture content) that can affect composting condition were measured. Optimum

composting condition such as temperature and level of composting gaseous that promotes high mushroom production will evaluated in this study.

1.3 Justification

This research was conducted to determine the optimum condition for the composting of oil palm EFB for the mushroom production and also to determine if any microclimatic factor such as temperature, moisture content, soil pH and EFB substrate conditions (temperature, pH, moisture) that can affect the composting condition. Other factor such as gas produced during composting was investigated to see if the effect of gaseous has an impact on composting condition.

1.4 Objective:

The objectives of this study were:

1. To determine the effect of composting period on *V. volvacea* mushroom production.

2. To determine the suitable composting condition such as environmental temperature, soil pH, moisture content and level of composting gaseous such as oxygen gas and carbon monoxide gas that can promotes high mushroom production.

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