PRODUCTION OF VOLVARIELLA VOLVACEA MUSHROOM USING OIL PALM EMPTY FRUIT BUNCH AS SUBSTRATE IN HUTAN SIMPAN AYER HITAM, PUCHONG

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By

NUR NAJMA ATHIRAH HASIM

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

My humble effort I dedicate to my sweet and loving father & mother (Hasim bin Abdul Ghani & Siti Ruhaidah binti Mohd Rosdi), my sisters and brother. Thanks for underlying love, relentless support, and concerns to me.

This research also dedicated to my beloved friend (Muhd Azim Syahmi bin Abd Latif) and my best friend (Nur Nadia binti Hasim). Whose affection, love, encouragement and prays of day and night make me able to get such success and honor.

Last but not least, I would like to dedicate this research to all my dear friends. In a nut shell, heartfelt gratitude towards individuals who are involved in the making of this thesis by sharing knowledge and experiences in related field.

ABSTRACT

Volvariella volvacea is an edible mushroom and has been cultivated in China. In China, this mushroom also known as warm mushroom as it needs a warm temperature to grow well. The growing stages are divided into two which is button stage and mature stage. The mature stage is when it is in egg stage, elongate stage and when the volva is ruptured. This study was conducted in Hutan Simpan Ayer Hitam, (HSAH), Puchong and the objectives were to determine the effect of some microclimatic factors, and environment factors EFB bed condition and bed orientation on *V.volvacea* mushroom production and to investigate the suitable microclimate of tropical forest and suitable bed orientation that promotes mushroom production in HSAH. The Empty Fruit Bunch (EFB) was used as compost material and 20 replicates of EFB bed were made with two different orientations, North-South and East-West. The process of mushroom harvesting took 30 days respectively and the total and weight recorded into the excel software. The results of the study showed that, microclimatic factors, bed condition and bed orientation did not give the significance effect towards mushroom production. Based on the analysis, the suitable microclimate and environmental condition was in HSAH that promote 44.5 kg mushrooms are 26˚C to 30˚C, with relative humidity is 70-90 %, pH is 6-7 in between, moisture content is 3 (dry+) to 6 (normal+) with light intensity were 570.7 lux.

ABSTRAK

Volvariella volvacea ialah sejenis cendawan yang boleh dimakan dan mula ditanam di negara China. Di China, cendawan ini dikenali sebagai cendawan panas kerana boleh tumbuh dengan baik di suhu yang tinggi. Peringkat tumbesaran cendawan ini terbahagi kepada dua iaitu peringkat butang dan peringkat matang. Peringkat matang bagi cendawan ini termasuklah peringakt dimana cendawan ini berbentuk telur, memanjang dan apabila volva sudah terbuka. . Kajian pembelajaran ini dijlankan di Hutan Simpan Ayer Hitam, (HSAH), Puchong, and objektif kajian adalah untuk menentukan kesan iklim-mikro dan keadaan persekitaran, keadaan EFB dan orentasi batas terhadap pertumbuhan cendawan *V.volvacea* dan bertujuan untuk mencari iklim-mikro yang sesuai di hutan tropika dan kesesuaian arah batas tanaman cendawan yang menggalakkan pertumbuhan cendawan. Tandan kelapa sawit kosong (EFB) digunakan sebagai bahan kompos dan 20 batas menggunakan EFB dibuat mengikut 2 arah batas tanaman yang berbeza. Proses penuaian cendawan memerlukan masa selama 30 hari berturut-turut dan jumlah cendawan dan berat direkodkan didalam perisian excel. Keputusan kajian menunjukkan iklim-mikro persekitaran, keadaan batas, dan arah batas tidak memberikan kesan terhadap pertumbuhan cendawan. Keadaan iklim-mikro yang sesuai dan keadaan persekitaran yang didapati di HSAH ialah suhu,26 ˚C hingga 30 ˚C, kelembapan relative ialah 70-90 %, pH diantara 6 hingga 7, kandungan lembapan ialah 3 (kering+) hingga 6 (normal+) bersam sinaran cahaya 570.7 lux.

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Thank you very much. May Allah bless us always.

APPROVAL SHEET

I certify that this research project report entitled 'Production of *Volvariella volvacea* moshroom using oil palm empty fruit bunch as substrate in Hutan Simpan Ayer Hitam, Puchong' by 'Nur Najma Athirah Hasim' has been examined and approved as a partial fulfilment of the requirements for the degree of Bachelor of Wood Science and Technology in the Faculty of Forestry, Universiti Putra Malaysia.

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LIST OF ABBREVIATIONS

EFB	Using empty fruit bunch
EW	East-West
HSAH	Hutan Simpan Ayer Hitam
ICMBMP7	Seventh International Conference on Mushroom Biology and Mushroom Products
kg	Kilogram
MC	Moisture content
NS	North-South
PKS	Palm kernel shell
POME	Palm oil mill effluent
RH	Relative humidity
V. volvacea	*Volvariella volvacea*

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Volvariella volvacea also known as paddy straw mushroom is to be part of family Plutaceae and it is basidiomycetes. It is edible mushroom and it can grow at tropic and subtropics area. China already started this mushroom cultivation in early 1822 (Chang, 1972). The Buddhist monks of Nanhua temple have cultivated this mushroom for their own purpose and as a tribute to the royal family. Other than China, *V. volvacea* is also planted widely in the Philippines, Malaysia and other Southeast Asian countries around 1932 to 1935 (Chang, 1972) This paddy straw mushroom is containing of nitrogenous organic compound which good to make a healthy diet. This mushroom has several advantages like requirement of the tropical or sub-tropical climate, fast growth rate, easy cultivation technology, and good acceptability at consumers' level.

This paddy straw mushroom is much popular no way less than white button mushroom because it is having great mixes of all traits like flavor, smell, and high substance of protein. Fruiting body development process is start with the formation of white hyphal aggregates, which form in a cluster and followed by several morphological stages. The successive stages are called as "button", "eggs", "elongation", "mature" stages respectively. Differentiation between the stages can be seen start at the 'button' stage.

At mature stage, this mushroom will enlarge from button and become an umbrella like after the rupture of the volva. *Volvariella Volvacea* is one of the popular mushroom in Southeast Asia as a high-quality human food source, and is one of the most important cultivated mushrooms worldwide. Karnan et al., (2016) stated that *V.volvacea* is listed as fifth of edible mushroom and it is very important in the world. It begun to be cultivated in China as early as 1822 and the cultivation of this paddy straw mushroom become worldwide. Since then, its cultivation has been conducted in various countries outside of the region (Ahlawat & Tewari, 2007). This edible fungus also can grow well on a cellulosic agricultural residues and industrial waste (Akinyele & Adetuyi, 2005).

The amounts of agricultural wastes (agro-waste) that are generated all over the world are quite huge. Bioconversion of wastes into organic manure is of great interest for productive use of wastes and their recycling through agricultural usages. Roughly, substrate that used to cultivate this mushroom is paddy straw. However, many studied had been done (Kamalakannan et al., 2016) in order to find a suitable substrate to cultivate it such as a combination of rice straw and cotton waste compost, cotton waste, oil palm bunch waste and oil palm pericarp waste.

An alternative is using the empty fruit bunch (EFB) as a substrate for mushroom cultivation. Cultivation of mushroom in developing countries has become attractive for many reasons.

The cultivation of edible mushroom like *V.volvacea* on this waste may thus be a value added process capable of converting these materials, which are otherwise considered wastes; into foods and feeds.

By cultivate *V. volvacea* on this substrate, which use EFB, may increase economy in agribusiness sector as this is one of the valuable resources (Abdullah & Sulaiman, 2013). It may develop a new enterprise since it can be produce a nutritious mushroom product. One of the interesting fact is, it can grow on agriculture wastes. It enables to acquire substrates at low price or even free of cost and to conserve environment by recycling of wastes. In the humid tropic, lands that are being cultivated continuously may lead some problem such as loss of soil fertility also loss of yield. High costs and deficits do not encourage the use of fertilizers, therefore the need to use local and external plants that are usually thrown away.

In Malaysia, the authorities had introduced *Volvariella volvacea* mushroom at rubber estate area since 2014 in Padang Terap, Kedah by using empty fruit bunch (EFB) as substrate (Azimi, 2017). This mushroom has been introduced due to lower price or rubber in the world market at that particular time to help increase the rubber smallholders' income. Agriculture and Agro-based ministry suggested that mushroom can be cultivated on a commercial basis in degraded forest. It is to maintain and repair the fertility of soil.

1.2 Problem Statement

Volvariella volvacea is an edible mushroom and one of the famous mushrooms among other edible mushroom. This type of mushroom had been cultivated in a rubber plantation and oil palm plantation in Malaysia as early 2014. Some studies have been conducted on paddy straw mushroom cultivation in Padang Terap, Kedah, (Azimi, 2017) and it is suggested to be cultivated in degraded forest. Although it is suggested to cultivate in degraded forest, but there is lack of information and limited scientific report published on microclimatic factors, EFB condition, and orientation of beds regarding this cultivation. Some smallholders suggested that optimum composting range for the EFB is for 9 days (Rashid, 2016 & Harres, 2016). Thus there is lacking information about the optimum range of microclimatic factors as well as other parameter such as orientation of beds either North-South or West-East direction that affect the *V. volvacea* mushroom production in tropical area.

1.3 Justification

This research about to find the optimum range of microclimatic factor and the differences of the bed orientation that can affect the *Volvariella volvacea* mushroom will give benefit to others especially for the farmer. As far as we are concern, and there is very little study that had been done on the bed orientation too, which oriented North-South and West-East but only mention about the suitable range for the microclimate condition for mushroom production in the degradation forest.

Therefore, I take this opportunities by done some research on effect of bed orientation to the *V. volvacea* mushroom cultivation and find the optimal range for this mushroom to be cultivated in the degraded forest instead of in the plantation area. For farmer, they will gain some information and knowledge since there is information which condition and area that is suitable to cultivate this mushroom. On top of that, they can earn some side income since this mushroom can be sold with high price in the market. This mushroom gets high demand especially from restaurants and farmer will get opportunities by cultivate *V. volvacea* mushroom.

1.4 Aim and Objectives

The objectives of this study are:

1. To investigate the suitable microclimatic factors (temperature, relative humidity, light intensity, soil pH and moisture) and bed condition (temperature, moisture content and pH) that promotes mushroom production in Hutan Simpan Ayer Hitam, Puchong.
2. To determine the effect of different bed orientation (North-South and East-West) on *V.volvacea* mushroom production.

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