

UNIVERSITI TEKNOLOGI MARA

**CHARACTERIZATION AND
GROWTH ADAPTATION OF
Volvariella volvacea CULTIVATED ON
PALM OIL EMPTY FRUIT BUNCH
PELLET**

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ABSTRACT

Mushrooms are popular valuable foods due to its component that are low in calories, carbohydrates, fat, sodium and cholesterol-free. However, among all edible mushrooms, *Volvariella volvacea* (paddy straw mushroom) produces low yield and biological efficiency (BE) compared to other edible mushroom species. Moreover, current *V. volvacea* cultivation technology using palm oil empty fruit bunch (POEFB) stalk as substrate have some limitations and thus reduces the commercialization value for its cultivation. Thus, this research aims to introduce the POEFB pellet as substitutes for POEFB stalk which is smaller in sizes and easier to manage. This study involved 3 research objectives, which are determination of the morphogenesis profiling of *V. volvacea* mycelium following different substrate and spawn preparation method, optimization of the physiochemical parameters on growth of *V. volvacea* following different substrate weight, cultivation area, substrate formulation and substrate treatment, and evaluation of the lignocellulolytic degradation during *V. volvacea* fruiting body induction. Preliminary study using test tube cultivation showed addition of CaCO₃ to POEFB increases the growth rates by twofold. Conversely, irradiation of the spawn resulted in no significant changes in growth rates as compared to the control spawn. Optimization of physiochemical parameters showed a large amount of POEFB (6kg) used in a substrate formulation with smaller cultivation area (A1) demonstrated the highest biological efficiency (BE) of *V. volvacea*. Additionally, POEFB pellet mixed with black soil (F3) is the best formulation for *V. volvacea* cultivation (generating a BE=17.75%). A pre-autoclaved substrate treatment (ST2) generated the highest BE (14.95%) compared to non-treated substrate and steam treated substrate. Based on the lignocellulolytic enzymes degradation, three enzymes detected which are cellulases, xylanase and laccase. The F3 formulation exhibit the highest lignocellulolytic degradation compared to others. It was observed that lignocellulolytic was highest after 7 days of incubation and resulting in downward pattern when incubation approaching to 35 days mark. In conclusion, POEFB fibre pellet can increase the biological efficiency and suitable to be used as substrate for *V. volvacea* growth. For future study, it is recommended to further investigate the factors that influence the transition between pinhead into button form in term of its biochemistry and molecular study, as these aspects remain unresolved.

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CHAPTER 1

INTRODUCTION

1.1 Research Background

Volvariella volvacea or paddy straw mushroom was first cultivated in China and thus is often referred to as Chinese mushroom (Ahlawat & Tewari, 2007). It is commercially grown in tropical countries due to its dependency on high environmental temperature and humidity (Singh et al., 2020; Chakravarty, 2011). Mainly cultivated outdoor, *V. volvacea* is fairly easy to manage and only requires a short period of time to grow (Ahlawat & Tewari, 2007). However, despite having a lot of nutritional and medicinal benefits, *V. volvacea*, produces low yields compared to other species. Thus, a lot of studies done on *V. volvacea* has been fixated on improving the yield and biological efficiency of *V. volvacea* (Umor et al., 2020).

This study aims to research for better and more efficient method for *V. volvacea* cultivation. This includes experimentation of different substrate formulations and phyiochemical optimization of substrate. This study also analyze the effects of enzymes and celluloses degradation on the growth of *V. volvacea*. Moreover, this study also focuses on utilizing POEFB pellet as main materials for substrate in *V. volvacea* cultivation. POEFB pellets is the newest development in *V. volvacea* cultivation strategy. It is lighter and easier to obtain compared to other materials such as paddy straw or cotton waste. It is also a great alternative to palm oil empty fruit bunches that naturally comes in greater size and weight than POEFB pellets.

1.2 Problem Statement

In ASEAN countries including Thailand, Malaysia and Indonesia, cultivation of *Volvariella volvacea*. is commonly done using straw wheat residue and POEFB whole stalk. However, detail knowledge on the growth pattern and integrated approaches to use POEFB fibres as an alternative growth medium for *V. volvacea* is still understudied and not fully explored. Furthermore, current practise using the POEFB whole stalk was