

UNIVERSITI TEKNOLOGI MARA

**OPTIMISATION OF VOLVARIELLA
VOLVACEA CULTIVATION
METHOD IN UTILISING SOLID
WASTES AND ITS PERFORMANCE
AFTER ACUTE GAMMA
RADIATION**

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ABSTRACT

Volvariella volvacea, commonly known as paddy straw mushroom, is an edible mushroom that has lower biological efficiency (BE) than other popular edible mushrooms, making it less appealing for local farmers to cultivate. To encourage wider cultivation, there is a need to optimise the preparation and cultivation methods to suit the local farmers budget, local climate, and geography. In this study, the fastest mycelial extension (2.355 ± 2.227 cm) and mycelial colonization duration (4.76 ± 0.98 days) of *V. volvariella* was observed when preparing the grain seedling by soaking corn grain in boiling water for 5 minutes and mixing them with 5% limestone. Next, the usage of solid wastes for cultivation was also examined by using paddy straw (PS), palm oil empty fruit bunch (EFB) and waste paper (WP). 100PS shows the shortest duration for harvesting (25.67 ± 0.58 days). Whereas 100WP and 50EFB:50WP shows the heaviest (24.00 ± 10.58 g) and longest (4.93 ± 0.78 cm) fruiting body respectively. The best yield (124.00 ± 32.05 g) and BE ($12.40 \pm 3.20\%$) was measured cultivated on 50PS:50WP. Further examination on the performance of *V. volvacea* mutant strain for cultivation was also done by cultivating on 50PS:50WP. It shows shorter harvesting duration (24.00 ± 1.00 days), heavier fruiting body (17.91 ± 6.42 g), improved yield (13.73 ± 2.74 g), and BE ($13.73 \pm 2.74\%$). The results shown suggests that optimising the cultivation method, combined with mutagenesis, can improve the overall performance of *V. volvacea* during cultivation.

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CHAPTER 1

INTRODUCTION

1.1 Research Background

Volvariella volvacea or also known as the paddy straw mushroom is an edible fungus that grows and form fruiting bodies at a temperature range of 28°C to 35°C (Chen *et al.*, 2019; Hou *et al.*, 2018). It is a delicious and juicy mushroom that is rich in nutrients and has medical value (Roy *et al.*, 2014). The ability of *V. volvacea* to grow at a relatively high temperature makes it one of the most popular cultivated mushrooms in tropical regions (Hou *et al.*, 2018). Prior to 1970, *V. volvacea* are known to be cultivated only using paddy straw but paddy straw alone is not sufficient as a composting material as it contains a low level of nutrients and has a slow rate of decomposition (Rajapakse, 2011). Nowadays, rice bran, saw dust and corn husk have been incorporated in the media substrate to further improve *V. volvacea* growth. Hence it is important to study the effectiveness of other types of composting material such as solid wastes from agriculture or municipal sites in *V. volvacea* cultivation as it will help in providing a low-cost alternative and in return contributes to the effort of increasing sustainability in mushroom production. It is also important for the economy as it may give rural farmers job opportunities. As stated by Nur Sakinah et al (2019), farmers preferred to cultivate *V. volvacea* for the past decades. Due to the high preferences from the farmers, *V. volvacea* has contributed to 5% of total production in commercial mushroom industry.

Even though *V. volvacea* is one of the preferred mushroom species for cultivation, it has low biological efficiency (BE) when compared to other edible mushrooms which poses a challenge in commercializing this species globally. Not only that, *V. volvacea* cultivation method also requires a longer preparation duration and extensive skills in handling. Hence it is important to optimise the method of cultivation as well as improving its BE to make it more competitive in the mushroom industry. The method that was studied in the effort to improve the yield and BE for commercialization is optimizing the method of preparing *V. volvacea* grain seedlings, experimenting with solid wastes formulation, and inducing mutagenesis of *V. volvacea*. Inducing mutagenesis is a method where a selected plant was treated with physical or chemical