OPTIMIZATION OF CULTURE CONDITIONS FOR MYCELIAL GROWTH OF BLACK OYSTER MUSHROOM (*Pleurotus ostreatus*)

JOHN TROY A. BAGSIC

An Undergraduate Thesis Submitted to the Faculty of the Department of Biological Sciences, College of Arts and Sciences, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines
in Partial Fulfillment of the Requirements
for the Degree of

BACHELOR OF SCIENCE IN BIOLOGY
(Major in Microbiology)

JUNE 2019

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF APPENDICES

LIST OF APPENDIX TABLES

LIST OF APPENDIX FIGURES

ABSTRACT

BAGSIC, JOHN TROY A., Department of Biological Sciences, College of Arts and Sciences, Central Luzon State University, Science City of Munoz, Nueva Ecija, Philippines, **JUNE 2019, OPTIMIZATION OF CULTURE CONDITIONS FOR MYCELIAL GROWTH OF BLACK OYSTER MUSHROOM (*Pleurotus ostreatus*).**

Adviser: SOFRONIO P. KALAW Ph.D.

Black oyster mushroom (*Pleurotus ostreatus*), is an edible mushroom characterized by the production of fruit bodies with an eccentric stalk and a wide cap shaped like an oyster shell, with widest portion of the cap being away from the stalk. In the present study the mycelial growth was evaluated on various indigenous culture media namely: coconut water gulaman, corn grit decoction gulaman, rice bran decoction gulaman, potato sucrose gulaman and potato dextrose agar (control). Moreover the effect of different conditions such as pH, aeration, illumination and temperature was also investigated. The mycelial diameter, mycelial density and incubation period were used in determining the optimum growth conditions.

Among the indigenous culture media evaluated, rice bran decoction gulaman significantly recorded the largest mycelia growth diameter and thickest mycelial density. In terms of the pH of the media, *P. ostreatus* registered maximum mycelial growth in a medium having a pH of 5.5. Moreover, incubation in dark condition favored the growth of the mushroom. *P. ostreatus* incubated at room temperature significantly exhibited wider mycelia diameter and shorter incubation period. The study also revealed that the aeration condition did not significantly affect the rate of colonization of the mushroom.

LITERATURE CITED

Beetz, A. & Kustudia, M. (2004). Mushroom cultivation and marketing. *Agriculture and Food Science Research, 2*(1), 6-11

Bellettini, M. B., Fiorda, F. A., Maives, H. A., Teixeira G. L., Avila, S., Hornung, P. S., Junior, A. M., & Ribani, R. H. (2016). Factors affecting mushroom *Pleurotus* spp. *Saudi Journal of Biological Sciences.* 1-14.

Bulseco, M. G., Abella, E., & Reyes, R. G. (2005). Morphogenesis of *S. commune,* a wild edible mushroom of Mt. Nagpale, Abucay Bataan, Philippines. *Journal of Nature Studies.* 4(1), 20-28.

Burlingame, B., Mouille, B. amd R. Charrondiere, (2009). Nutrients, bioactive non nutrients and anti nutrients in potatoes. *Journal of Food Composition and Analysis.* 1(22), 494-502.

Campos, C. S., Vianez, B. F. & De Abreu, R. L. S. (2011). Productivity and nutritional composition of *Lentinus strigosus* (schwinitz) fries mushroom from the amazon region cultivated in sawdust supplemented with soy bran, recent trends for enhancing the diversity and quality of soybean products. Retrieved from http://www.intechopen.com/books/recent-trends-for-enhancing-the-diversity-and-quality-of-soybeanproducts/prductivity-and-nutritional-composition-of-lentinus-strigosus-schwinitz-fries-mushroom-from-the-amazon.

Carlile, M. J. & Watkinson, S. C. (1994). The fungi. Antimicrobial Activity of Mycelia of Oyster Mushroom Species (*Pleurotus* spp.) and their Liquid Filtrates(In Vitro). *Journal of Medical and Bioengineering*. 4(5), 31.

Celine B. (1992). The difference between hyphae and mycelium. July 2017. Retrieved fromhttp://www.differencebetween.net/science/nature/difference-betweenmycelia -and-hyphae/.

Chang, S. T., & Quimio, T. H. (1982). Tropical mushrooms; biological nature and cultivation methods. Chinese University Press.

Chang, S. T. (1999). Global impact of edible and medicinal mushrooms on human welfare in the 21st century: non-green revolution. *International Journal of Medicinal Mushrooms*, 1(1), 1-7.

Chang, S. T. (1999). World production of cultivated and medicinal mushrooms in 1997 with emphasis on lentinus edodes. *International Journal of Medicinal Mushrooms.* 1(1), 291 – 300.

Chang, S. T., & Miles, P. G. (2004). Mushrooms cultivation, nutritional value, medicinal effect, and environmental impact. CRC Press. Boca Raton, Florida, 431.

Chang, S. T., & Hayes, W. A. (2013). The biology and cultivation of edible mushrooms. Academic Press.

Chang, S. T. (2010). Retrieved from: Mushroom production. Encyclopedia of life support systems. 7.

Das, N. & Mukherjee, M. (2007). Cultivation of *Pleurotus ostreatus* on weed plants. Bioresource technology 98: 2723 – 2726. retrieved from www.science direct.com on 07/08/2007.

Dulay, R. M. R., Flores, K. S., Tiniola, R. C., Marquez, D. H. H., Dela Cruz, A. G., Kalaw S. P. & Reyes R. G. (2015). Mycelial biomass production and antioxidant activity of lentinus tigrinus and lentinus sajor-caju in indigenous liquid culture. Mycosphere 6 (6), 659–666.

Elisashvili (2012). Submerged cultivation of medicinal mushrooms: bioprocesses and products (review). *International Journal of Medicinal Mushrooms*, 14(3), 211–239.

Friel, M. T. & Mcloughlin A. (2000). J. Production of a liquid inoculum/spawn of *Agaricus bisporus*. Biotechnology letters, 22(5), 351-354.

Ganeshpurkar, A., Rai, G., & Jain, A. P. (2010). Medicinal mushrooms: towards a new horizon. Retrieved on September 14, 2018 from http://www.phcogrev.com/article.asp?issn=09737847;yer=2010;volume=4;issue=8;spage=127;epage=135;aulast=ganeshpurkar.

Gibbs, P. A., Seviour, R. J., & Schmid, F. (2000). Growth of filamentous fungi in submerged culture, *Biotechnology*, 20, 17-48.

Gibriel, A. Y., Ahmed, M., Rasmy, N. & Abdel-Rehem N. S. (1996). Cultivation of Oyster Mushrooms (*Pleurotus* spp), Evalutaions of different media and organic substrates. 1(1), 415-421.

Hami, H. (1990). Cultivation of oyster mushroom (*pleurotus* spp.) On saw dust of different woods. Department of plant pathology, university of agriculture, Faisalabad, Pakistan. 1(1), 1–2.

Higaki, M., Reyes, R. G., Iyima, T., Eguchif & Divina, C. C. (2001). Mushroom science and technology in Central Luzon, Philippines for food security in the 21st century. 4(3), 2–9.

Ibekwe, V. I., Azubuike, P. I., Ezeji, E. U., & Chinakwe, E. C. (2008). Effects of nutrient sources and environmental factors on the cultivation and yield of oyster mushroom (*Pleurotus ostreatus*). *Pakistan Journal of Nutrition,* 7(2), 349-351.

Jacob, J. K. S., Kalaw, S. P. K. & Reyes R. G. (2015). Mycelial growth performance of three species of Pleurotus on coconut water gelatin. Current research in environmental & applied mycology, 5(3), 263-268.

Kiber, B. & Peksen, A. (2001). Nutritional and environmental requirements for vegetative growth of edible ectomychorizal mushroom *Tricholoma terreum*, Zemdirbyste agriculture, 98(4), 409-414.

Magday, J. C., Bungihan, M. E., & Dulay, R. M. R. (2014). Optimization of mycelial growth and cultivation of fruiting body of Philippine wild strain of *G. lucidum. Current Research in the Environment and Applied Mycology,* 4(2), 162-172.

Masoumi, F., Pourianfar, H. R., Masoumi, A. & Mendi, E. M. (2015). A study of mycelium characterization of several wild genotypes of the button mushroom from Iran. *International Journal of Advanced Research,* (3)2, 236-246.

Miguel, J. T. (2012). Optimization of culture conditions for mycelial growth and fruiting body production of Pleurotus spp. Unpublished undergraduate thesis. Central Luzon State University, Science City of Munoz, Nueva Ecija.

Okwulchie, I. K., & Okwujiako, I. A. (2008). The effect of some physical and nutritional factors on the vegetative growth of *Pleurotus ostreatus* var. Florida Eger, under tropical conditions. *Dynamic Biochemistry, Process Biotechnology and Molecular Biology,* 2(1), 41-44.

Pathak, R., Joshi, N. & Dwivedi R. R. (2009). Eco-friendly production of *Agaricus bisporus* (lange) imbach (white button mushroom). 1(6), 57–60.

Paul, C. B., Usen, U. A. & Otunba, A. A. (1983). Cultivation, proximate composition and mineral content of *P. ostreatus*. *International Journal of Medicinal Mushrooms* 4(8), 255-258.

Pilát (aphyllophoromycetideae): in vitro studies. *International Journal of Medicinal Mushrooms*, 13(2), 131-43.

Peng, J. T. (2000). Effect of rice bran on the production of different king oyster mushroom strains during bottle cultivation. *Journal of Agricultural Research China.* 49(3), 60-67.

Powell, M. (1997). Myco-nutri: *Pleurotus ostreatus*. Retrieved on semtember 14, 218 from http://www.mushroomnutrition.com/pleurotus-ostreatus.

Priya, J. L. & Srinivasan V. (2013). Studies on the antibacterial activities of mushroom. *International Journal of Current Microbiology and Applied Science*, 2(6), 184-189.

Reyes, R. G., Abella, E. A. & Manaloto, A. P. (1992). Use of indigenous materials as alternative culture media for pleurotus sajor-caju, *Central Luzon State University Scientific Journal*, 1(13), 34-40.

Reyes, R, G. R. Abland, W., & U. Rau. (2009). Coconut water as a novel culture medium for the biotechnological production of *Schizophyllan. Journal of Nature Studies*, 7(2), 14.

Rjarathnam, S. & Bano, Z. (2010). *Pleurotus* mushrooms. Part i a. Morphology, life cycle, taxonomy, breeding, and cultivation. Critical reviews in food science and nutrition, 26(2), 157-223.

Robson, G.D., Van West, P. & Gadd, G. M. (2007). Exploitation of fungi. *Campbridge University*, 1(1), 345.

Rout, M. K., Mohapatra, K. B., Mohanty, P. & Chandan S. S. (2015). Studies on effect on incubation temperature and light intensity on mycelial growth of oyster mushroom, *Journal Crops and Weeds*, 11(2), 44-46.

Royse, D. J. (2002). Influence of spawn rate & commercial delayed release of nutrient levels on *Pleurotus conocopiae* yield, size and time to production. *Applied Microbiology and Biotechnology*. (17), 191 – 200.

Sakamoto, Y., Tamai, Y., &Yajima, T. (2004). Influence of light on the morphological changes that takes place during the development of the *Flammulina velutipes* fruit body. *Mycosphere*, 45(5), 333-339.

Sevilla, N. R. L. (2012). Optimization of culture conditions for mycelia and basidiocarp production of Pleurotus ostreatus. Unpublished undergraduate thesis. Central Luzon State University, Science City of Munoz, Nueva Ecija.

Shah, P. & Modi, H. A. (2018). Optimization of culture condition for biomass production of *G. lucidum. International Journal of Current Microbiology and Applied Science*, 7(2), 1882-1889.

Sung, G. H., Shrestha, B., Hans, S. K., Kim, S. Y., & Sung, J. M. (2010). Growth and cultural characteristics of *COrdyceps carnalis* collected from Korea. *Microbiology*, 38(4), 274-281.

Valdez, A. S. (2014). Optimization of culture condition for mycelial growth of Pleurotus djamor. Unpublished undergraduate thesis. Central Luzon State University, Science City of Munoz, Nueva Ecija.

Wani, B., Bodha, R. H. & Wani, A. H.(2010). Nutritional and medicinal importance of mushrooms. *Journal of Medicinal Plants Research*, 4(24), 2598-2604.

Zhang, R. X., Li, J., & Fadel, J. (2002). Oyster mushroom cultivation with rice and wheat straw. *Biology Resource Technology,* 4(8), 255-258.

Zervakis, N., Karunaratha S. C., Hyde, K. D., & Chukeatirote, E. (2001). Optimal conditions of mycelial growth of three wild edible mushroom from northern Thailand. *Acta Biologica Szegediensis*, 58(1), 39-43.