EFFECT OF LOCAL SUBSTRATES ON THE PERFORMANCE OF OYSTER MUSHROOMS (*Pleurotus ostreatus)*.

By

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DECLARATION

I, OLARKER DANCAN hereby declare that I conducted this research and wrote report with the guidance of my supervisor and it has never been submitted anywhere before for any award of any academic credential.

NAME;

…….

SIGN;……DATE……

APPROVAL

This research report was approved by:

ACADEMIC

SUPERVISOR……

……

SIGN……

DATE…….

DEDICATION

I would like to dedicate this report to Almighty God and my entire family members for their support toward financing this research project. In a special way I also dedicate this report to the late Grandfather Mr. Wokorach Peter, my mother Akullu Teddy, and my father Mr. Opiyo Benson for their love, care and support they rendered to me when growing up and in the entire education career.

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LIST OF ABBREVIATIONS

OPM	Office of the Prime Minister
SSA	Sub Saharan Africa
FAO	Food and Agriculture Organization of the United Nations
LSD	Least Significant Difference
UBOS	Uganda Bureau of Statistics
UNDP	United Nations Development Programme
USA	United States of America
IPC	Integrated Food Security Phase Classification
Cotton SH	Cotton Seed Husk

Abstract

Oyster mushroom (*Pleurotus ostreatus)* is considered as potential for improving food and nutritional status and income small holder households. Even though it is that important, type of substrate is believed to affect the growth and yield of the oyster mushroom yet available refuses may be used for production. This study assessed the effect of locally available materials used as substrates on the performance of oyster mushroom. Six different locally available materials including; millet husk, wood shavings, cotton seed husk, coffee husk, greengram husk and groundnut shells were assessed. Oyster mushroom spawns were inoculated at a rate of 60g/1000g of sterilised substrates and replicated 15 times for all the substrates. The inoculated gardens were incubated and later kept under controlled environment for cropping. Data collected included; time taken to pinhead development, cap diameter, stalk length, biological efficiency, fresh and dry weights. Results of the study revealed that oyster mushroom grown on cotton SH, coffee husk, wood shaving, greengram husk, groundnut shells, and millet husk had varying growth and yield. Time taken to first pinhead development of oyster mushroom was shortest in Millet husk (12.7 days) and longest in greengram husk (19.40 days). Stalk length and cap diameter was highest in the finger millet husk and cotton SH with average of 3.66 cm and 5.3cm respectively. Cotton SH and finger millet husk produced oyster mushroom with the highest both fresh and dry yields with fresh of 282.6g and 342.6g respectively and dry yields 31.27g from cotton SH and 34.02g from millet husk, and of and biological efficiency while the least was observed in wood shavings and groundnut shells. This shows that the best substrates for mushroom production are finger millet husk and cotton SH and followed by coffee husk. Basing on the study findings more studies are needed to explore more locally available materials for use as substrates and as well to assess the effect of combinations of materials for substrates in addition to establishing the nutrient content of oyster mushroom grown using the locally available substrates.

CHAPTER ONE
INTRODUCTION

1.1 Background of the study

Uganda is one of the countries with the fastest-growing population in Africa. This rapid growth in population poses a threat to the food and nutrition security of the county. At least, 33% of infants and 33% women suffer from food and nutrition insecurity in Uganda (OPM, 2017). About 26% of Ugandans are food insecure and they are mostly in Integrated Food Security Phase Classification (IPC) Phase 2 (OPM, 2017). The increasing rate of food insecurity in the country is mostly attributed to the high level of poverty that lowers the purchasing power of many households and reduced agricultural output. Agricultural output is further lowered by the impact of climate change, resurgence of crop and animal disease, low yielding varieties and poor agronomic practices. The reduced Agricultural output caused by impacts of climate change has been seen as the greatest cause of food and nutrition insecurity in Uganda. Climate change has greatly increased food and nutrition insecurity in the region through frequent occurrence of prolonged drought and unpredictable weather pattern (Lisk, 2009). Recently, the COVID 19 pandemic has also drastically accelerated the food insecurity due to the disruption in the food supply chain brought about by the lockdown. With the continuous reduction in crop yields due to increased impact of climate change, edible mushroom production is picking up steadily to improve on the food and nutrition security for the people in Uganda. Mushroom such as oyster provides good nourishment in Uganda due to the high level of nutrients like zinc, iron and calcium (Adediran *et al*., 2016).

Oyster mushroom (*Pleurotus ostreatus*) is easier to grow and has a wide range of nutrition benefits such as low calorific value, antioxidant properties, vital proteins, high level of dietary fibre and vitamins such as vitamin D (Randive, 2012). In Uganda, oyster mushroom production became prominent in the 1990s, and its seen as a potential income generating activity for both rural and urban farmers (Pavlík & Byandusya, 2016). Oyster mushroom is still among the highly profitable ventures in Uganda though high cost of substrate such as cotton seed husk is still a major challenge for many farmers (Mayanja, 2018). This has significantly affected the production and yield of the oyster mushroom. Thus, there is need to explore the effectiveness of other locally available substrates in oyster mushroom production in order to reduce costs of production in Uganda. Moreover, Girmay *et al*. (2016) also emphasised the need to explore more locally available agricultural waste products in order to compare their potential and effectiveness in oyster mushroom production. This study

REFERENCES

Adebayo, G. J., Omolara, B. N., & Toyin, A. E. (2009). *Evaluation of yield of oyster mushroom (Pleurotus pulmonarius) grown on cotton waste and cassava peel*. *8*(2), 215–218.

Adebisi, Y. A., Ibrahim, K., Lucero-Prisno, D. E., Ekpenyong, A., Micheal, A. I., Chinemelum, I. G., & Sina-Odunsi, A. B. (2019). Prevalence and Socio-economic Impacts of Malnutrition Among Children in Uganda. *Nutrition and Metabolic Insights*, *12*, 117863881988739. https://doi.org/10.1177/1178638819887398

Adediran, S., Elizabeth, O., Adegbenjo, A., & Olufunmilayo, E. (2016). *Enhancing food security : cultivation of oyster mushroom (Pleurotus sajor- caju) using agroforestry wastes*. 25–28.

Against, P., Waste, C., & Straw, F. (2004). *Pakistan Journal of Phytopathology*. *31*(02), 149–154. https://doi.org/10.33866/phytopathol.030.02.0435

Assement, S. (2017). *SECURITY ASSEMENT*. *January*.

Birhane, E., & Kebede, F. (2016). *Effect of substrates on the yield , yield attribute and dietary values of oyster mushroom (Pleurotus ostreatus) in the pastoral regions of northern Ethiopia*. *January 2017*. https://doi.org/10.18697/ajfand.76.15695

Carrasco, J., Zied, D. C., Pardo, J. E., Preston, G. M., & Giménez, A. P. (2018). Supplementation in mushroom crops and its impact on yield and quality. *AMB Express*, 1–9. https://doi.org/10.1186/s13568-018-0678-0

Das, D., Kadiruzzaman, M., Adhikary, S., Kabir, M., & Akhtaruzzaman, M. (2014). Yield performance of oyster mushroom (Pleurotus ostreatus) on different substrates. *Bangladesh Journal of Agricultural Research*, *38*(4), 613–623. https://doi.org/10.3329/bjar.v38i4.18946

Diacono, M., Persiani, A., Testani, E., & Montemurro, F. (2019). *Recycling Agricultural Wastes and By-products in Organic Farming : Biofertilizer Production , Yield Performance and Carbon Footprint Analysis*. 1–17.

Earnshaw, D. M., Dlamini, B. E., & Masarirambi, M. T. (2012). *Growth and Yield of Oyster Mushroom (Pleurotus ostreatus) Grown on Different Substrates Ammended with Varying Levels of Wheat Bran*. *1*(4), 111–117.

Fernandes, T., Garrine, C., Ferr, J., Bell, V., & Varzakas, T. (2021). *applied sciences Mushroom Nutrition as Preventative Healthcare in Sub-Saharan Africa*.

Girmay, Z., Gorems, W., Birhanu, G., & Zewdie, S. (2016). Growth and yield performance of Pleurotus ostreatus (Jacq . Fr .) Kumm (oyster mushroom) on different substrates. *AMB Express*, 1–7. https://doi.org/10.1186/s13568-016-0265-1

Hassan, F. R. H., Medany, G. M., & Abou Hussein, S. D. (2010). Cultivation of the king oyster mushroom (plerrotus eryngii) in Egypt. *Australian Journal of Basic and Applied Sciences*, *4*(1), 99–105.

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). 7*(2), 349–351.

Jafarpour, M., Zand, A. J., Dehdashtizadeh, B., & Eghbalsaied, S. (2010). *Evaluation of agricultural wastes and food supplements usage on growth characteristics of Pleurotus ostreatus*. *5*(23), 3291–3296.

Jonathan, S. G., & Fasidi, I. O. (2001). Effect of carbon, nitrogen and mineral sources on growth of Psathyerella atroumbonata (Pegler), a Nigerian edible mushroom. *Food Chemistry*, *72*(4), 479–483. https://doi.org/10.1016/S0308-8146(00)00265-X

Khan, N. A., Ahmed, W., Khan, M. A., Yasin, O., Asad, S., & Munir, S. (2021a). Effect of Different Kinds of Substrates on the Growth and Yield Performance of Pleurotus sapidus (Oyster Mushroom). *Asian Food Science Journal*, *20*(1), 18–24. https://doi.org/10.9734/afsj/2021/v20i130250

Khan, N. A., Ahmed, W., Khan, M. A., Yasin, O., Asad, S., & Munir, S. (2021b). Effect of Different Kinds of Substrates on the Growth and Yield Performance of Pleurotus sapidus (Oyster Mushroom). *Asian Food Science Journal*, *January*, 18–24. https://doi.org/10.9734/afsj/2021/v20i130250

Kortei, N. K., & Wiafe-kwagyan, M. (2014). *Evaluating the effect of gamma radiation on eight different agro-lignocellulose waste materials for the production of oyster mushrooms (Pleurotus eous (Berk .) Sacc . strain P-31). 9*, 83–90.

Lisk, F. (2009). Overview: The Current Climate Change Situation in Africa. *Climate Change in Africa: Adaptation, Mitigation and Governance Challenges*, 8–15. http://www.unicef.org/esaro/Climate_Change_in_Africa.pdf

Majesty, D. K. C., Winner, K., Univeristy, R., Prince, O., & Ijeoma, E. (2019). Nutritional, Anti-nutritional and Biochemical Studies on the Oyster Mushroom, Pleurotus ostreatus. *EC Nutrition*, *14*(1), 36–59.

Mandeel, Q. A., & Mohamed, S. A. (2005). *Cultivation of oyster mushrooms (Pleurotus spp .) on various lignocellulosic wastes*. 601–607. https://doi.org/10.1007/s11274-004-3494-

Mayanja, I. (2018). *A study of the profitability of oyster mushroom cultivation in Kampala metropolitan area , Uganda*. 80–97.

Mondal, S. R., Rehana, M. J., Noman, M. S., & Adhikary, S. K. (2010). *Comparative study on growth and yield performance of oyster mushroom (Pleurotus florida) on different substrates*. *8*(2), 213–220.

Mondal, S., Rehana, J., Noman, M., & Adhikary, S. (1970). Comparative study on growth and yield performance of oyster mushroom (*Pleurotus florida*) on different substrates. *Journal of the Bangladesh Agricultural University*, *8*(2), 213–220. https://doi.org/10.3329/jbau.v8i2.7928

Muswati, C., Simango, K., Tapfumaneyi, L., Mutetwa, M., & Ngezimana, W. (2021). The Effects of Different Substrate Combinations on Growth and Yield of Oyster Mushroom (Pleurotus ostreatus). *International Journal of Agronomy*, *2021*. https://doi.org/10.1155/2021/9962285

Neupane, S., Thakur, V., Bhatta, B., Pathak, P., & Gautam, B. B. (2018). *PERFORMANCE OF DIFFERENT SUBSTRATES ON THE PRODUCTION OF OYSTER MUSHROOM (Pleurotus florida) AT GOKULESHWOR , DARCHULA*. *8*(6), 231–240. https://doi.org/10.29322/IJSRP.8.6.2018.p7832

Nongthombam, J., Kumar, A., Ladli, Manikanta, B., Madhushekhar, M., & Patidar, S. (2021). A review on study of growth and cultivation of oyster mushroom. *Plant Cell Biotechnology and Molecular Biology*, *22*(5), 55–65.

Pavlík, M., & Byandusya, P. (2016). *The effectiveness of the oyster mushroom growing on the locally available substrates in rural regions of Africa and Europe*.

Petersen, R. H., & Hughes, K. W. (1997). A New species of Pleurotus . *Mycologia*, *89*(1), 173–180. https://doi.org/10.1080/00275514.1997.12026768

PFISTERER, F., & BLOSS, W. (1984). Development of Cu. *Solar Cells*, *12*, 155–161.

Randive, S. D. (2012). *Cultivation and study of growth of oyster mushroom on different agricultural waste substrate and its nutrient analysis*. *3*(4), 1938–1949.

Ruilova Cueva, M. B., Hernández, A., & Niño-Ruiz, Z. (2017). Influence of C/N ratio on productivity and the protein contents of Pleurotus ostreatus grown in differents residue mixtures. *Revista de La Facultad de Ciencias Agrarias*, *49*(2), 331–344.

Ruiz-rodriguez, A., Soler-rivas, C., Polonia, I., & Wichers, H. J. (2010). International Biodeterioration & Biodegradation Effect of olive mill waste (OMW) supplementation to Oyster mushrooms substrates on the cultivation parameters and fruiting bodies

quality. *International Biodeterioration & Biodegradation*, *64*(7), 638–645. https://doi.org/10.1016/j.ibiod.2010.07.003

Sałata, A., Lemieszek, M., & Parzymies, M. (2018). The nutritional and health properties of an oyster mushroom (Pleurotus ostreatus (Jacq. Fr) P. Kumm.). *Acta Scientiarum Polonorum, Hortorum Cultus*, *17*(2), 185–197. https://doi.org/10.24326/asphc.2018.2.16

Salman Naeem, M., Asif Ali, M., Ali, S., Sardar, H., Liaqat, R., & Shafiq, M. (2014). *Growth and yield performance of oyster mushroom on different substrates*. *12*(1), 9–15.

Serunjogi, S. K., Rwakaikara-silver, M., Nakavuma, J., & Isikhuemhen, O. S. (2005). *Evaluation of Growth and Yield of Indian Oyster Mushroom Pleurotus pulmonarius (Fr .) Quél . on Three Agricultural Wastes Supplemented with Cottonseed Hulls (CSH) in Uganda*. *7*(3), 2005.

Sharma, S., Yadav, R. K. P., & Pokhrel, C. P. (2013). *Growth and Yield of Oyster mushroom (Pleurotus ostreatus) on different substrates*. *2*(1), 3–8.

Sheet, N. F. (2017). *Malnutrition in Uganda*.

Singh, D. R. (2017). A Review on Different Benefits of Mushroom. *IOSR Journal of Pharmacy and Biological Sciences*, *12*(01), 107–111. https://doi.org/10.9790/3008-120102107111

Sitaula, H. P., Dhakal, R., Dc, G., & Kalauni, D. (2004). *Effect of Various Substrates on Growth and Yield Performance of Oyster Mushroom (Pleurotus ostreatus) in Chitwan , Nepal*. *6*(2018), 215–219. https://doi.org/10.3126/ijasbt.v6i3.20859

Sofi, B., Ahmad, M., & Khan, M. (2014). *Effect of different grains and alternate substrates on oyster mushroom (Pleurotus ostreatus) production*. *8*(14), 1474–1479. https://doi.org/10.5897/AJMR2014.6697

Tavarwisa, D. M., Govera, C., Mutetwa, M., & Ngezimana, W. (2021). Evaluating the Suitability of Baobab Fruit Shells as Substrate for Growing Oyster Mushroom (Pleurotus ostreatus). *International Journal of Agronomy*, *2021*. https://doi.org/10.1155/2021/6620686

Tirkey, V. J., Simon, S., & A AL, A. (2017). Efficacy of different substrates on the growth, yield and nutritional composition of oyster mushroom- Pleurotus florida (Mont.) Singer. *Journal of Pharmacognosy and Phytochemistry*, *6*(4), 1097–1100. www.iosrjournals.org

Zhang, Y., Geng, W., Shen, Y., Wang, Y., & Dai, Y. (2014). *Edible Mushroom Cultivation for Food Security and Rural Development in China: Bio-Innovation, Technological Dissemination and Marketing*. 2961–2973. https://doi.org/10.3390/su6052961