

Potential of Spent Mushroom Substrates (SMSs) from Oyster Mushroom (*Pleurotus ostreatus*) Production as Growth Media for Vegetative Growth of Garden Balsam (*Impatiens balsamina*)

John Mark R. Francisco^{1,*} and Roden D. Troyo²

¹ Department of Horticulture, Faculty of Agriculture and Food Science, Visayas State University, Visca, Baybay City, Leyte, Philippines 6521-A

² Ornamental Division, Department of Horticulture, Faculty of Agriculture and Food Science, Visayas State University, Visca, Baybay City, Leyte, Philippines 6521-A

*Correspondence: johnmark.francisco@vsu.edu.ph



1 Introduction & Aim

Spent Mushroom Substrate (SMS) is the residue generated at the end of the mushroom cultivation process, this unutilized substrate and mushroom mycelium left after harvesting (Danai et al., 2011). With the steady growth of the mushroom industry, the volume of SMS produced annually has significantly increased, presenting challenges in storage and disposal (Phan and Sabaratnam, 2012).

SMS still contains grown mycelium, a significant number of heterotrophic microorganisms, and essential nutrients necessary for growing a good crop. As a result, various applications of SMS have been explored in recent years (Othman et al., 2020). Recycling waste is a crucial component of an environmental approach for sustainable waste management, incorporating the principles of reduce, reuse, and recycle. Recently, there has been increasing interest in utilizing waste from SMS, though limited knowledge exists regarding the use of discarded *Pleurotus ostreatus* substrate, particularly from oyster mushroom cultivation, as a soil co-substrate for plant cultivation.

However, limited information is available on the use of discarded *Pleurotus ostreatus* (oyster mushroom) substrates as soil co-substrates for plant cultivation. This study was conducted to evaluate the potential of SMS from *Pleurotus ostreatus* as a growing medium for garden balsam (*Impatiens balsamina* L.) under pot culture conditions.

2 Methodology

The materials that were used on the conduct of research are the following: Spent Mushroom Substrates (SMS), garden balsam seeds, polyethylene bag (4x7inches), spraying can, garden soil, measuring tape, pen and paper, and camera for documentation.



Figure 1. Spent Mushroom Substrate used.



Figure 2. Garden balsam used.

Experimental Treatments

- Treatment 0 - Control (100% Garden Soil)
- Treatment 1 - 25% SMS & 75% Garden Soil
- Treatment 2 - 50% SMS & 50% Garden Soil
- Treatment 3 - 75% SMS & 25% Garden Soil
- Treatment 4 - 100% Pure Spent Mushroom Substrates (SMS)

Experimental Layout

- The experiment was laid out in Randomized Complete Block Design (RCBD) with five treatments (5) and three replication.

Data Gathered

- Growth performance
- Substrate analysis



Figure 3. Schematic representation of activities conducted.



Figure 4. Cultural Management Practices.

3 Findings

Response Comparison of Plant Height (cm) from Different SMS Treatments on Garden Balsam at Weekly Interval

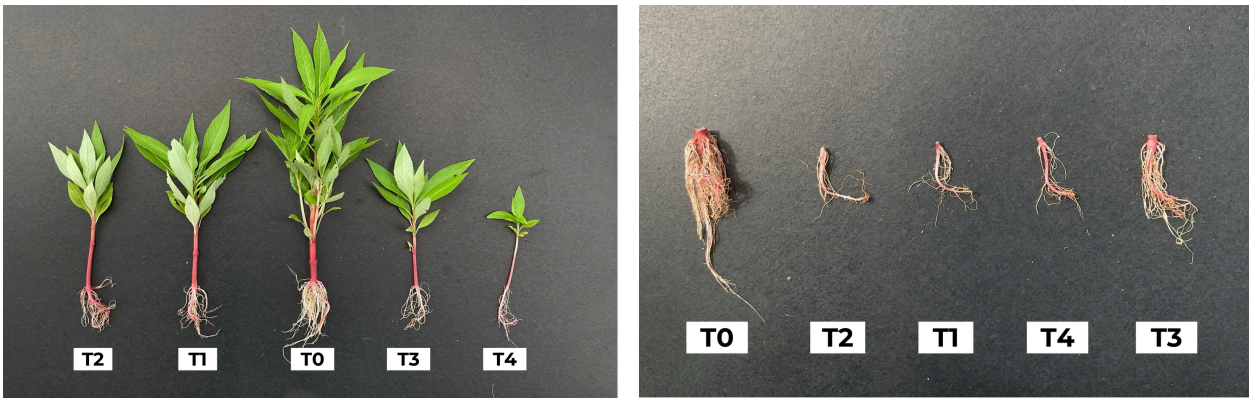


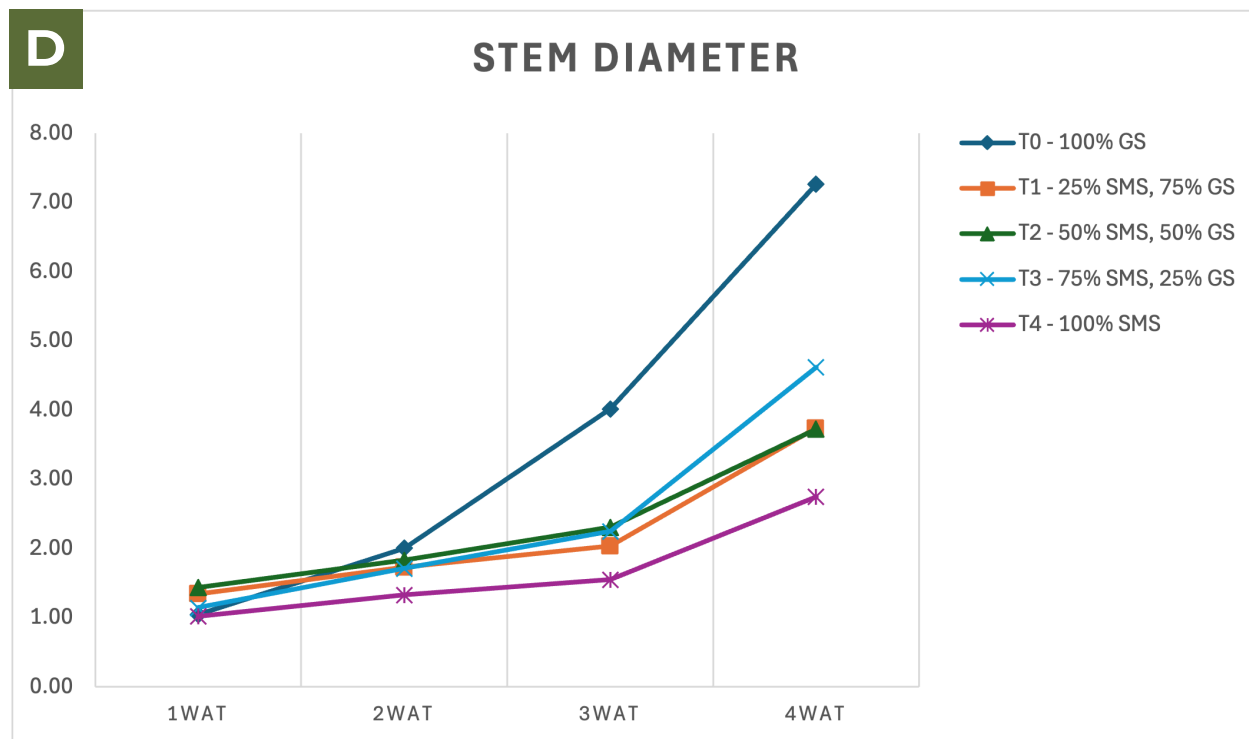
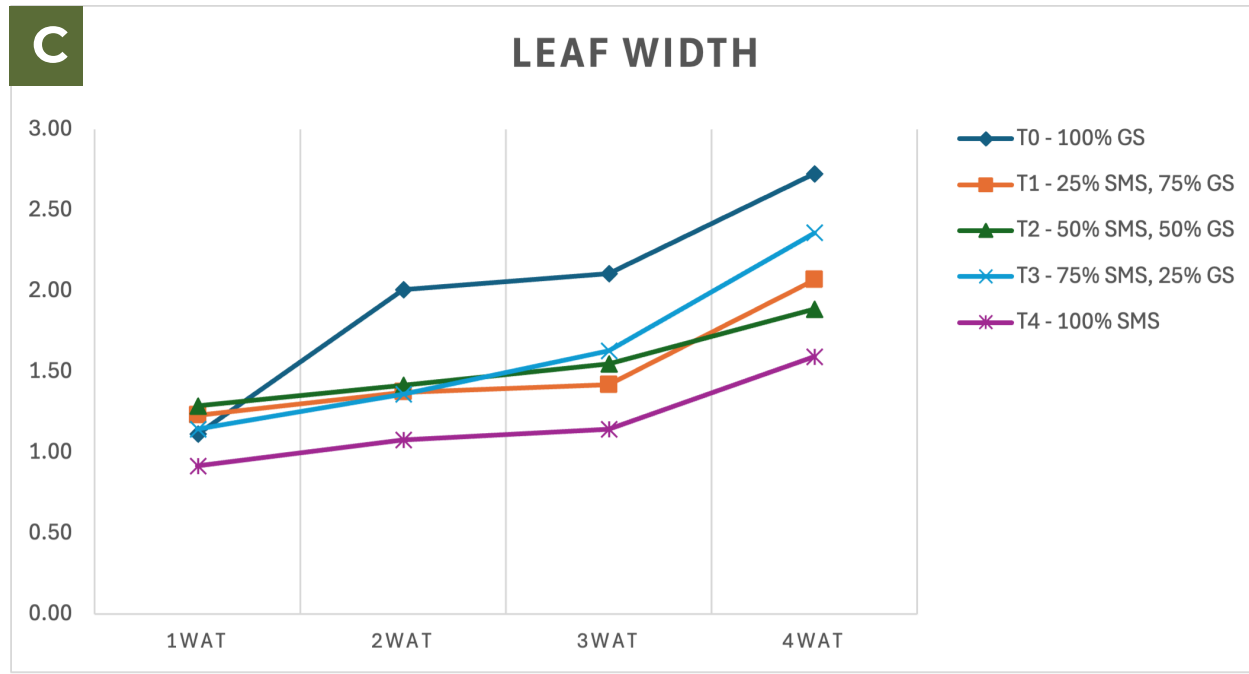
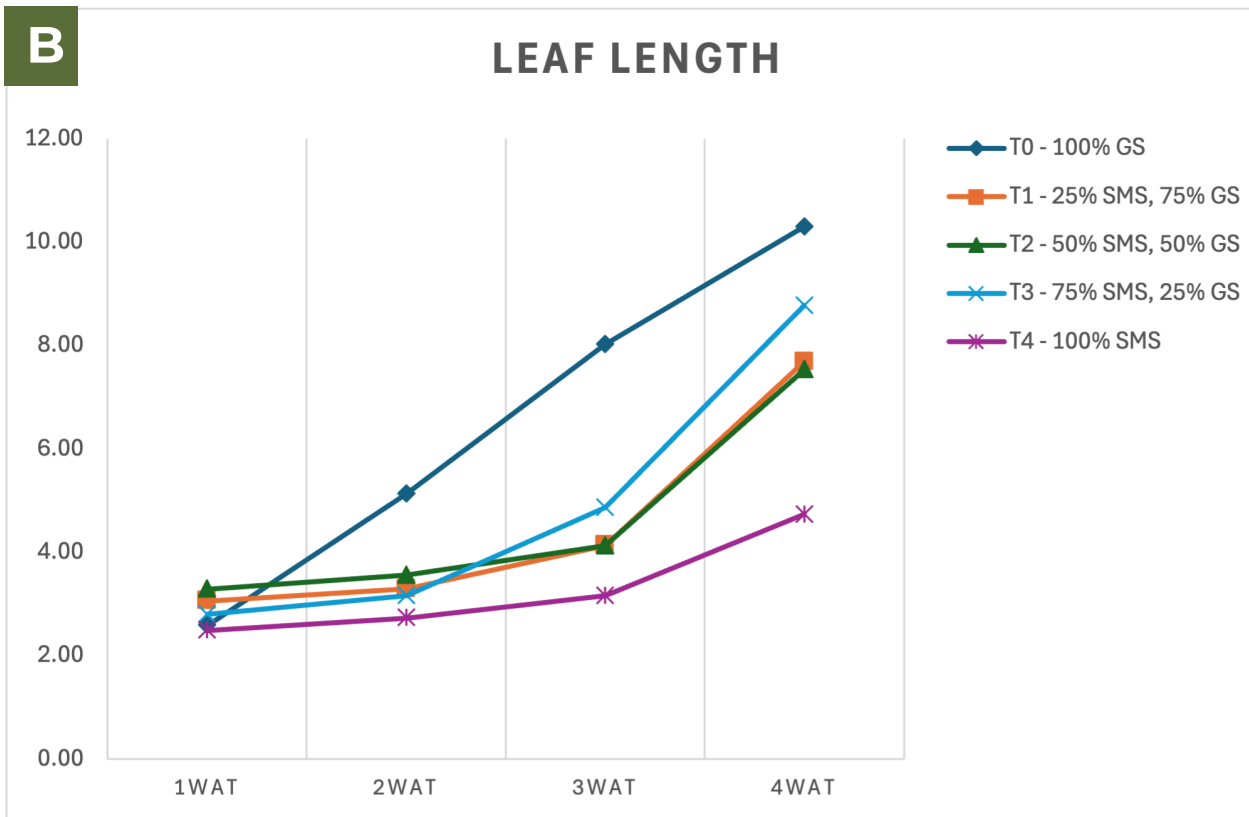
Figure 5. Plant height of garden balsam as influenced by different concentrations of SMS at 4 WAT.

Figure 6. Root length of garden balsam as influenced by different concentrations of SMS at 4 WAT.

Total N (%)	Total P (%)	Total K (%)	Organic Matter	pH
0.919	0.344	Not available	15.248	5.3

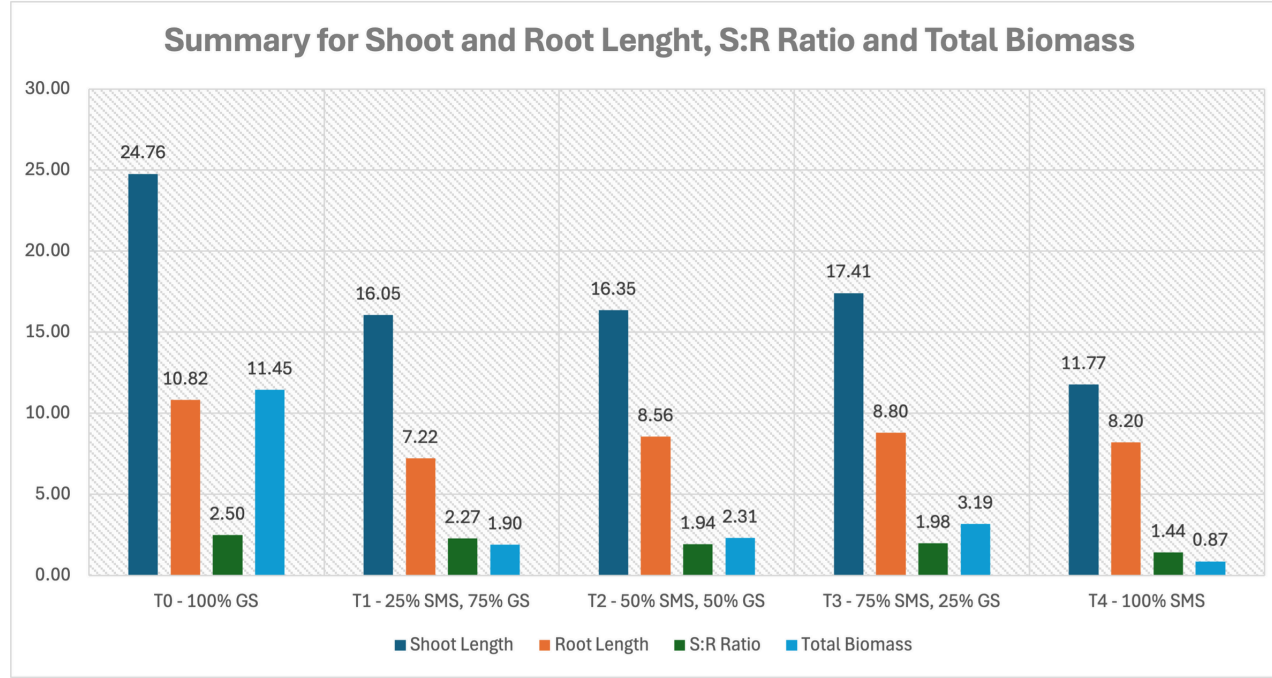
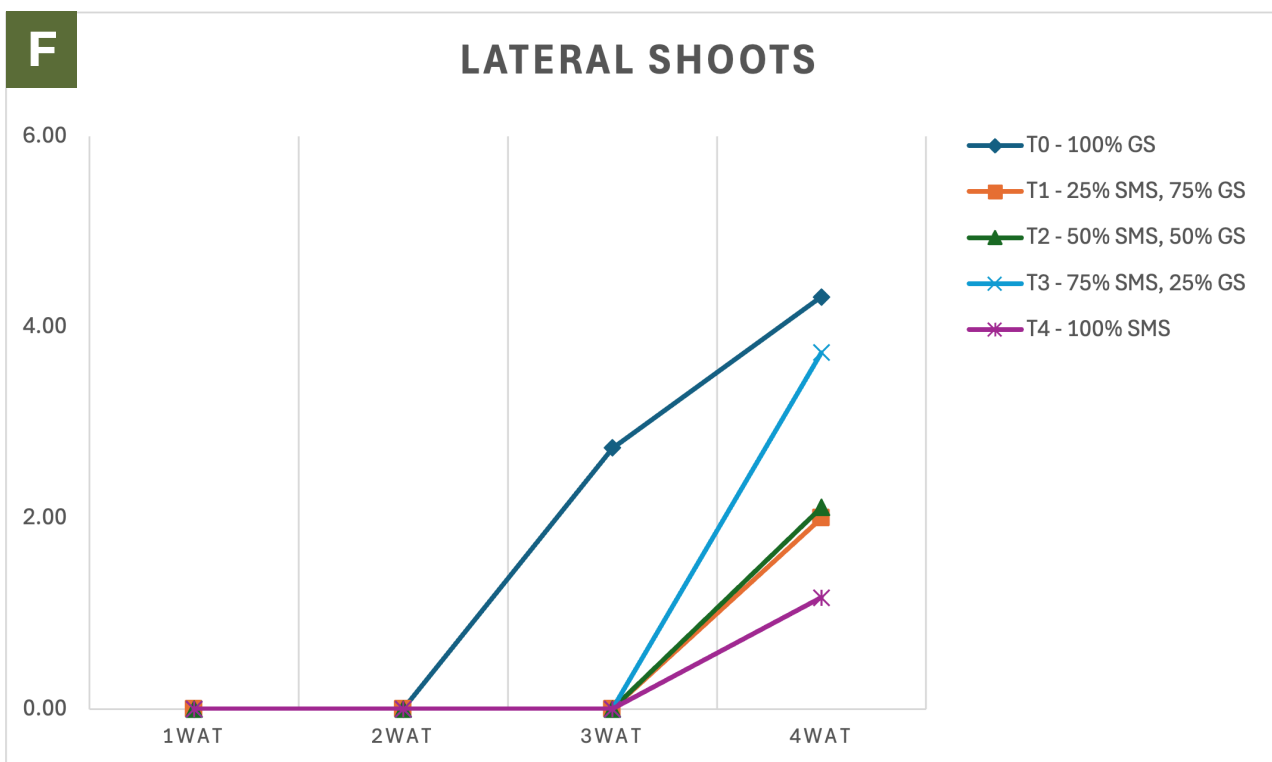
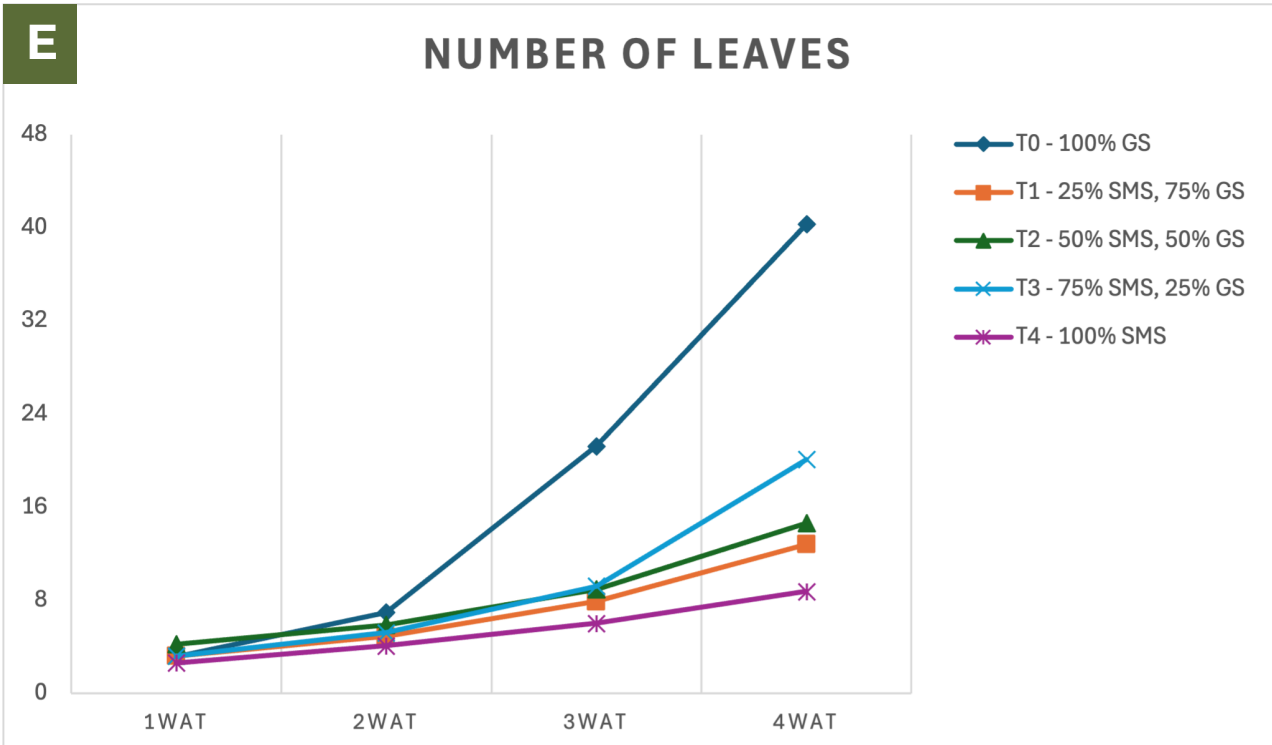
Figure 7. Substrate Analysis from VSU - Central Analytical Laboratory Services.

Response Comparison of Leaf Length (cm), Leaf Width (cm) and Stem Diameter (mm), Number of Leaves, Lateral Shoots from Different SMS Treatments on Garden Balsam at Weekly Interval:



Funding

This work was supported and fully funded by the Department of Science and Technology (DOST) – Accelerated Science and Technology Human Resource Development Program (ASTHRDP) Scholarship.



4 Conclusions

- The incorporation of SMS with GS, particularly at ratios of 50% SMS + 50% GS and 75% SMS + 25% GS, promotes moderate growth performance in garden balsam. This suggests its potential as a partial organic amendment due to its organic matter contribution and soil structure improvement.
- Treatments with 100% GS consistently produced the best results across all growth parameters, while 100% SMS led to poor growth due to salinity, nutrient imbalances, and suboptimal substrate structure.
- The SMS substrate showed high organic matter content (15.248%) but low total nitrogen (0.919%) and phosphorus (0.344%), resulting in slow growth of garden balsam, highlighting the need for nutrient supplementation when used as a growing medium.

5 Recommendations

- Implement composting or leaching of Spent Mushroom Substrate (SMS) before use to reduce salinity, toxicity, and nutrient imbalances, enhancing its effectiveness as a growing medium.
- Include assessments of yield parameters such as the number of flowers per plant, flower size, flower weight, and fruit set percentage to evaluate the effectivity of SMS-based treatments on garden balsam.
- Conduct similar studies to identify the best SMS-to-soil ratios or incorporate SMS with other potting mixes such as rice hull, peat, moss, carbonized rice hull, and coco coir, particularly those plants with higher tolerance to organic substrates, slightly acidic pH, and salt content.

References

- Othman, N.Z., Sarjuni, M.N.H., Rosli, M.A., Nadri, M.H., Yeng, L.H., Ying, O.P., and Sarmidi, M.R. (2020). Spent Mushroom Substrate as Biofertilizer for Agriculture Application. Applied Environmental Science and Engineering for a Sustainable Future. Springer, Cham. https://doi.org/10.1007/978-3-030-39137-9_2
- Danai, O., Cohen, H., Ezov, N., Yehleli, N., and Levanon, D. (2011). Recycling of spent mushroom substrate (SMS) in avocado orchards.
- Phan, C.W., & Sabaratnam, V. (2012). Potential uses of spent mushroom substrate and its associated lignocellulosic enzymes. Appl Microbiol Biotechnol 96, 863–873. <https://doi.org/10.1007/s00253-012-4446-9>

Acknowledgements

The author thanks the Central Analytical Services Laboratory at Visayas State University, for its analytical support, and Mr. Boyet Sioc Rele of the Farmvel Mushroom Farm for the free SMS.

