Potential Applicability of Post Mushroom Substrate as an Alternative Nutrient Media for Oyster Mushroom (*Pleurotus* Spp) Cultivation

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Abstract

The substrate released after mushroom crop harvest, better known as 'post mushroom substrate '(PMs) has shown multifaceted utility in integrated farming which includes recycling for the cultivation of subsequent crops. There are ample research findings to prove the high nutritional status of well decomposed PMS and its suitability as organic manure for most agricultural food crops. Based on these evidence, the present study was aimed to investigate the potential applicability of PMs as a cheap substitute for high valued nitrogen source frequently used in Oyster mushroom (Genus: Pleurotus) cultivation. Basal growth substrate for Pleurotus consisted of 100% sawdust (SD), w/w alone and in two separate combinations with PMS@25% and 50%w/w. These three substrates were further enriched with total prescribed dosage of legume powder and rest of the amendments while half rate of the recommended legume powder was also added separately with other amendments to the substrate consisted of 25% and 50% PMS. The experiment was laid in Complete Randomized Design having 5 treatments and 15 replicates and was repeated two times. Spawn run rate, mushroom yield, and biological efficiency corresponding to each treatment were recorded. The highest values ($P>0.05$) pertaining to spawn run rate, mean mushroom yield and the biological efficiency were recorded from two growth mixtures comprising 50%PMS+50%SD irrespective of the inclusion of the N enrichment as prescribed or half recommendation. Nevertheless no significant difference was observed ($P>0.05$) between these two treatments suggesting the suitability of PMS as a cheap nitrogen source to substitute high valued legume powder used in mushroom substrate preparation

Key words: Oyster mushroom, Post mushroom substrate, Yield, Biological efficienc

Introduction

Oyster mushrooms (*Pleurotus* spp.) represent a group of artificially cultivable edible fungi and have high nutritive values. They have the ability to utilize lignocellulosic substrates for their development. Soft wood sawdust is the main ingredient used for the artificial mushroom cultivation in Sri Lanka. However, the inconsistent nature of the availability of soft wood sawdust as well as multifaceted utility of PMS and its good nutrient value compel to recycling of PMS in Oyster mushroom cultivation. This investigation is an attempt to evaluate the potential applicability of post mushroom substrate (PMS) As an Alternative nutrient Media for Oyster mushroom (*Pleurotus*) cultivation.

Materials and methods

Experiment site: This study was carried out at Agriculture Research Station, Telijjawila from January 2011 to June 2012

Preparation of the substrate: Saw dust (*Albizia)* (SD), and spent mushroom substrate (SMS) were used on dry weight basis for substrate preparation. These organic materials were combined in the following ratios to be used as cultivation media. Post mushroom substrate was loosen and combined with saw dust according to the following ratios. Rice bran, mung bean powder, $MgSO_4$ and $CaCO_3$ were added to the each bag as substrate enrichments.(SE). For T1, T3 and T5 treatments, substrate enrichments were added according to the Department of agriculture (DOA) recommendation and half of the DOA recommended amount were added in T3 and T4 treatments.

T1 - 25% PMS + 75% SD + SE according to DOA
T2 - 25% PMS + 75% SD + ½ SE
T3 - 50% PMS + 50% SD + SE according to DOA
T4 - 50% PMS + 50% SD + ½ SE
T5 - 100% SD + SE according to DOA

The compost mixtures from the above 5 treatments were separately filled in to 32.5 cm × 17.5 cm polypropylene bags and were subjected to steam sterilization for 2-3 hours.

Mushrooms spawn inoculation and incubation: Grain spawns of American oyster were introduced in to sterilized and cooled compost media. The spawned compost bags were kept in darkness to enable the mushroom mycelial growth (incubation). At the end of the incubation period, upper portion of the spawned mushroom bags were cut open, placed in a shed in which conducive humid atmosphere was provided to facilitate the fruit body formation.

Experimental Design: The experiment was laid in Completely Randomized Design (CRD) inside the mushroom house having 5 treatments and 15 replicates. Experiment was repeated two times.

Data recording: Spawn run length was measured (cm) three weeks after spawning. Three flushes were harvested from each bag in opened neck portion and fresh weight (g) was measured.

Biological efficiencies were calculated according to the following equation,

$$\text{Biological efficiency \%} = \frac{\text{fresh weight of mushroom}}{\text{dry weight of substrate}} \times 100$$

Standard SD medium was compared with the similar data obtained from four treatments. Data was analyzed using SAS (Statistical analysis system) package (SAS incorporation, Anova with DMRT).

Results and Discussion

The values for the spawn run rate, mean mushroom yield and biological efficiency were highest and significantly different (P>0.05.) in mixtures containing 50%PMS+50%SD irrespective of the inclusion of N enrichment as prescribed or half of the recommendation. Also early pin head formation was observed in these mixtures. Nevertheless no significant difference was observed (P>.0.05) between these two treatments. Furthermore values pertaining to the growth and yield performance of the mycelia in treatment comprising 25%PMS+75%SD did not differ significantly with that of the control. It is believed that well decomposed PMS has the advantage of providing easily utilizable carbon source which is a prerequisite for the initial establishment of the Pleurtous mycelia. The presence of complex carbon compounds in sawdust based substrate requires decomposition prior to the release of utilizable carbon. Based on the analyzed N values corresponding to the different treatments, treatment with 50%PMS+50%SD recorded 0.238 % in comparison to the 0.105%N in the control. This clearly indicates the cost effectiveness of the PMS amended mixture as a Pleurotus mushroom growth substrate. In addition higher water holding capacity of the PMS amended substrate provide added advantages for the growth of the mycelia by providing conducive environment. Mushroom which grow on substrates which do not have a casing layer applied such as Pleurotus species (except P.eryngii) draw their moisture from the substrate (Quimio et al, 1990). Pure sawdust based substrate are more susceptible to dry air. PMS of Pleurotus mushroom is reported to hold several beneficial bacteria and application of PMS prior to the pasteurization would also help to suppress pathogenic fungi and bacteria.

Conclusion

This study suggest the suitability of PMS as a cheap nitrogen source to substitute high valued legume powder used in mushroom substrate preparation

Acknowledgment

The authors wish to express their gratitude to Dr. Sujatha Weerasinghe, Research Officer In charge and the staff, Agriculture Research Station, Telijjawila for their support and encouragement provided to conduct this experiment.

References

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