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Short Communication

COMPARISION OF TWO TYPES OF MUSHROOM-GROWING HOUSES FOR MUSHROOM PRODUCTION, ENVIRONMENT CONDITIONS AND INSECT ABUNDANCE

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INTRODUCTION

Mushroom production in Sri Lanka is not sufficient to meet the current and increasing demand within the country. One of the major reasons for the lack of quality mushroom is the insect damage, which directly affects the quality and quantity of the yield. Sciarid flies, phorid flies, cecid flies, mites, springtails, nematodes are some of the mushroom pests (Anon, 2010). As chemical control is not appropriate, farmers use some non-chemical methods such as light trapping, burning of neem leaves to control insect problems, but with limited success. Department of Agriculture of Sri Lanka has recommended to use insect-proof nets for the mushroom-growing houses to prevent entry of insects, which is considered as the most appropriate method to manage this problem. However, the currently used mushroom-growing houses in Sri Lanka consists of a roof, walls, doors and windows that cannot be easily converted to insect proof houses with nets.

Maintaining temperature, ventilation (CO_2 concentration), light and relative humidity (RH) inside the growing housed is necessary to obtain a higher mushroom yield. However, the temperature inside the growing house should suite the variety of mushrooms, where yhe tropical oyster mushroom needs an environmental temperature between 26-30 °C. Temperate varieties such as button mushroom, king oyster and shitake, etc., require cooler conditions with temperatures around 16-18 °C. Misting would be a necessity if the temperature in the mushroom house is too high for the chosen strain. Moreover, requirement of light (colour and intensity) depends on the mushroom strains where oyster mushrooms. Emergence of mushrooms with small caps and longer stems indicate that aeration and light requirements have not been met. In the complete absence of light, oyster mushrooms will emerge without caps but the stipe (mushroom stalk) forming a coral-like structure. Good control of the humidity during cropping is important for all types of mushroom. To maintain high humidity (80 - 90%) water should be sprayed several times per day (www.researchgate.net/profile) in the growing house.

The ambient CO_2 concentration in the growing room should be controlled by ventilation, especially during the fruiting body formation and development of mushrooms. Under high CO_2 levels or with less frequent ventilation, mushrooms produce long stipes with tiny caps, while they produce short stipes with broad caps under law CO_2 concentration or frequent ventilation. In mushroom species *Pleurotus ostreatus*, a CO_2 concentration higher than 1000 ppm will produce stipes that are too long resulting in mushrooms of lower quality (Mushworld, 2004).

Tyvek® is a newly introduced cladding material that resembles thin plastic paper used for various purposes in agriculture sector in the world. This cladding material has no macro holes, thus provide no opportunities for the insect to go through the material. However, it consists of micro holes supporting exchange of air, thus resulting in same environmental conditions between indoor (inside the growing house with new cladding material) and outdoor (www.materialconcepts.com/products/tyvek). The cladding material is guaranteed for five years by the manufactures. According to the producers this material is currently not in use for the mushroom-growing houses in the world. However, the special characters of this cladding material indicate the potential for its use to cover the mushroom-growing houses with the objective of controlling major insect pests of mushrooms. Therefore, this study was carried out with the objective of evaluating the insect pest control efficacy of a new cladding material in mushroom-growing houses.

MATERIALS AND METHODS

A currently used mushroom-growing house (EGH) (Figure 1) and a mushroom-growing house equipped with the new insect-proof cladding material (TYVEK®) (NGH) (Figure 2) were compared for productivity and benefit:cost ratio at the Regional Agricultural Research and Development Center, Department of Agriculture (DOA) at Makandura, Sri Lanka during 2014 *Maha* and 2015 *Yala* seasons.

Two species of mushroom (*Pleurotus ostreatus* and *P. saju caju*) were used and 100 bags of each species were divided in to 20 batches (five bags per batch). The bags were placed in an incubation room to facilitate the growth of mycelium under proper condition after inoculation of spawn. When the fully grown mycelium was visible (28 days after inoculation), 20 batches of each species were placed separately in each growing house. All cultural practices were same as existing oyster mushroom cultivation.

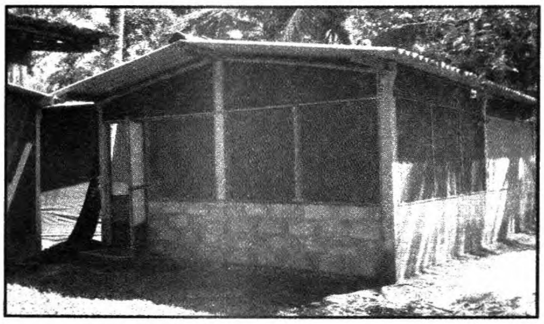

Figure 1. Growing house-existing type

Figure 2. Growing house with new cladding material

Environmental conditions (temperature, light and relative humidity), insect population (Quadrat Sampling Method), yield (quantity and quality) were recorded and data were analyzed by pooled t-test (p=0.05) using the SAS computer software package. The benefit:cost analysis for mushroom cultivation was performed for both growing houses.

RESULTS AND DISCUSSION

There were no significant differences in the environmental conditions (temperature, relative humidity and light) between the two growing houses. No insects were observed in the NGH equipped with the new cladding material, however, two types of insects were found in EGH.

The total yield of mushrooms did not depend on the growing house, however, there was a significant difference ($p<0.05$) of the marketable yield between two growing houses. The insect pest damage in the EGH was the main reason for high amount of non-marketable mushroom under existing type of mushroom-growing house. Proper ventilation inside the growing house is required for a better mushroom yield. Poor ventilation or higher CO_2 concentration condition could result in horn-shaped (coral shape) mushrooms. However, in the present experiment, horn-shaped or coral-shaped mushrooms were not observed in both growing houses due to proper ventilation. The results also indicate that the new cladding material used also facilitate air movement as provided in the manufacturer's information. A high benefit:cost ratio (2.36) was reported in the mushroom growing house equipped with new cladding material compared to that of the existing type growing house (2.24).

CONCLUSION

The mushroom-growing house equipped with the new cladding material Tyvek® resulted in similar environmental conditions and proper ventilation, no insect incidence, higher marketable yield and a higher benefit:cost ratio compared to that of the existing-growing houses. Hence, the new growing house type with the insect-proof cladding material is a viable solution to solve insect problems in mushroom cultivation to obtain an economical yield under Sri Lankan conditions.

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