RECYCLING OF MUSHROOM PEAT CASING SOIL THROUGH A PLASTIC MESH

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ABSTRACT

The objective of this research was to lower the cost of mushroom production through recycling peat soil by using a plastic mesh. Phase III compost was covered by a plastic mesh and the casing soil was spread on it. Mycelia penetrated the mesh and occupied casing soil as they did in casing without plastic mesh. Mean yield of mushroom collected over three flushes was not affected by plastic mesh. Piling of collected casing soil helped in decomposing of its remained mycelia from previous crop and bleaching it, brought down its EC to a desirable level. Reusing of treated peat soil did not have any effect on yield of next crop. Growers could therefore recycle it and use for next crop.

Keywords: Casing, Plastic mesh, Mushroom, Peat moss soil, *Agaricus bisporus*

INTRODUCTION

Casing the surface of composted substrate fully colonized by mycelium of mushroom (*Agaricus bisporus*) is an essential function in stimulating and promoting the development of fruit bodies. The key physical requirements of the soil used for casing include water holding capacity to supply water for the growth of mycelium and sporophores, sufficient porosity for mycelia respiration, and ability to resist structural breakdown following repeated watering, and suitable chemical and microbiological characteristics for sporophore initiation [1]. These characteristics are found in peat soil which is being used as casing material for several decades in many countries [2]. In many mushroom-growing areas of the world, there are no available sources of peat and in those available there is an environmental pressure against extracting peat for horticultural use [3].This has led to considerable research into possible peat alternatives for casing [4]. These alternatives include bark [5], spent mushroom compost [6], coconut fibre [7] and paper waste by-products [8]. However, none of these materials has replaced peat for casings on the market [9].

Some growers mix a percentage of spent mushroom compost with peat soil as casing material, but the yield of mushroom with this casing is not equal to that of peat. When casing the surface of composted material with peat soil, if we could prevent it from being mixed with compost, while it could perform its functions properly, it is possible to collect it after mushrooms being harvested and to reuse it. However it may need to be treated with some material and be bleached to regain some of its lost properties. The aim of this work was to find a way to collect and reuse the peat soil for mushroom production by recovering it from compost surface without being mixed by compost. This would bring down the cost of mushroom production by at least 25%.

MATERIAL AND METHODS

The blocks of phase II compost [10] were placed on the shelf of growing room with a temperature of 25 ˚C and 93% relative humidity for spawn running. Each block was considered as a unit of experiment. After 14 days, when the blocks were ready for casing, the surface of four blocks were evened and covered with a plastic mesh (the size of holes: 1 × 1 mm). Four neighboring blocks without being covered by the plastic mesh, were considered as control. Casing soil was applied as usual with 4.5 cm depth layer of original peat moss soil [9]. All other works including irrigation, ventilation and ruffling was the same for both controls and the blocks covered by plastic mesh. Mushrooms were harvested from each block separately. After harvesting the third flush, plastic mesh was lifted from the blocks with whole used casing soil on it.

The used casing soil was transferred to a container for measuring its properties such as EC (electrical conductivity), pH percentage of pore spaces and bulk density. These properties were determined by our soil lab according to the general protocols. The used soil was piled for three weeks for decomposition of mycelia remained from previous crop and was then leached with distilled water to bring down its EC to a recommended level. As pH was in the range of recommended, no attempt was done to adjust it. The used peat soil was then pasteurized at 60 ˚C for six hours to be reused as casing soil. At the next experiment four blocks of fully colonized phase III compost were cased with used peat soil and four others were covered with the original peat soil. The experiment was carried out as the first one. All factors affecting the yield of mushroom were the same for both controls and the blocks covered by plastic mesh and cased with reused peat. Data on yield of three flushes were collected separately, using each block as a unit of experiment or a replication. Means were compared using unpaired t-test.

RESULTS

Table 1 presents the mean and the t test statistic for comparison of yield of mushroom of control and the blocks covered with the plastic mesh. As it shows, there is not a significant difference between mean of the control and that of covered with plastic mesh. Plastic mesh did not prevent mycelia of penetrating the casing soil. When examining the mycelia penetration in casing soil on plastic mesh, it was observed that mycelia growth was the same in casing both with and without plastic mesh. The plastic mesh had not any inverse effect on both mycelium growth and yield. Plastic mesh, while being a cheap material, could help growers to collect peat casing soil without being mixed with compost material.

Table 1: Mean yield of blocks (20 kg with RE=67%) cased with original peat with and without plastic mesh

Type of casing soil	Mean of yield (kg/block)	t-test
Peat without plastic mesh	2.25	1.089
Peat with plastic mesh	2.14	Prob> |t|=0.3178

Peat collected on plastic mesh had retained its physical properties such as its pore space and bulk density (Table 2). The pH of used peat (pH=7.26) did not change significantly compared to the pH of original peat soil (pH=7.47) and it was in the range of recommended ones. The only chemical property which changed dramatically was EC due to evaporation of water from the surface of casing soil. EC of used peat soil (1247 µs cm^{-1}) was about 9 times of that of the original peat soil (154 µs cm^{-1}). Bleaching of collected peat with distilled water lowered EC to 540 µs cm^{-1}. Needs for bleaching depend on the EC of casing soil, the amount of water used at each bleaching and its frequency. Growers should monitor EC after each bleaching to set it at a desirable level. If needed, pH also could be adjusted, by calcium carbonate. The yield of mushroom cased by used peat soil was not different from that obtained of original peat soil (Table 2).

Table 2: Mean yield of blocks (20 kg with RE=67%) with original and used peat along with some other important properties

Type of casing soil	EC µs cm^{-1}	pH	Pore spaces (%v/v)	Bulk density dry (gl-1)	Mean of yield (kg/block)	t-test
Original peat	154.3	7.47	85.4	83.7	2.24	-0.873
Used peat	540.4	7.26	239	227	2.11	Prob> |t|=0.4162

DISCUSSION

Casing soil costs about 25 -30% of total costs of mushroom growing in Iran. As physical properties of reused soil is not changed and its chemical properties could be recovered by some treatments, collecting and reusing it would bring down the cost of producing mushroom in those countries importing it from abroad. In countries having supply of peat, using plastic mesh would bring down the pressure on peat mines and would help the ecosystem from destroying.

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