Yield of Oyster Mushroom (*Pleurotus Ostreatus*) Influenced by Different Sawdust Substrate

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Abstract- The experiment was carried out at the Biochemistry laboratory and Mushroom Culture House (MCH), Department of Biochemistry, Sher-e-Bangla Agricultural University, Dhaka, during the month of June to November' 2015 to investigate the performance of different sawdust on the yield of Oyster mushroom *(Pleurotus ostreatus).* Five different sawdust viz. mango tree *(Mangifera indica*), rain tree *(Albiia saman*), teak tree *(Tectona grandis*), mahogony tree (*Swietenia mahagoni*) and mixture of all four sawdust supplemented with 30 % wheat bran and 1 % $CaCO_3$ as basal substrate were selected for determine the yield of oyster mushroom (*Pleurotus ostreatus).* The highest weight of individual fruiting body (5.60 g), dry yield (35.15 g), biological yield (368.18 g) and economic yield (360.68 g) were also found in mango tree sawdust. Therefore, it can be concluded that mango tree sawdust supplemented with 30 % wheat bran can be further used as a better substrate for maximum yield of oyster mushroom *(Pleurotus ostreatus)* among following substrate.

I. INTRODUCTION

Mushroom is being widely used as food and food supplements from ancient times. They are increasingly being recognized as one of the important food items for their significant roles in human health, nutrition and diseases [1]. There is a common saying that "medicines and foods have a common origin" [2]. One of the world's biggest challenges is food insecurity. This problem is largely common in low and middle-income countries that mainly have poor food production systems and suffer from serious malnutrition. Such countries must find ways of improving food production to feed the vastly increasing human population. Substrate plays an important role in the yield and nutrient content of oyster mushroom. The substrates on which mushroom spawn (Merely vegetative seed materials) is grown, affects the mushroom production [3]. Oyster mushroom can grow on sawdust, rice and wheat straw and other agro-waste. Sarker *et al.* (2007) observed a remarkable variation in nutritional content of oyster mushroom in different substrates [4]. The demand for mushroom has been increasing due to population growth, market expansions, changing of consumer behavior and developments in the manufacturing to industries, storage, transportation and retailing. Gradually, the world mushroom production reached 33.4 million tons in 2007 from the 26 million tons in 2000 [5]. Oyster mushrooms are one of the most popular edible mushrooms and belong to the genus *Pleurotus* and the family *Pleurotaceae*. Many of the *Pleurotus* mushrooms are primary decomposers of hardwood trees and are found worldwide. The cultivation of oyster mushroom requires the use of cellulosic materials or residues such as cereals straw, cotton stalks, various grasses, weeds, reed stems, maize and sorghum Stover, sugarcane bagasse, banana residues, coffee pulp and coffee husk, cottonseed and sunflower seed hulls, peanut shells, rice husks, waste paper, wood sawdust and chips [6]. Therefore, the objective of the study is to know the suitable sawdust for the yield of oyster mushroom.

II. MATERIALS AND METHODS

The experiment was carried out to find out on the yield of oyster mushroom (*Pleurotus ostreatus*) grown on supplemented sawdust. The experiment was carried out at the Biochemistry laboratory and Mushroom Culture House (MCH) of the Department of Biochemistry, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh, during the period from June' 2015 to Noverber' 2015. Mother culture of oyster mushroom was collected from Mushroom Development Institute (MDI), Savar, Dhaka, Bangladesh. The experiment consists of five different types of sawdust with 30% wheat bran was taken as basal substrates. The experiment consists of the following treatments:

T_1: Mango tree (*Mangifera indica*) sawdust supplemented with 30% wheat bran and 1% lime
T_2: Rain tree (*Albiia saman*) sawdust supplemented with 30% wheat bran and 1% lime
T_3: Teak tree (Tectona grandis) sawdust supplemented with 30% wheat bran and 1% lime
T_4: Mahogany tree (*swietenia mahagoni*) sawdust supplemented with 30% wheat bran and 1% lime
T_5: Control (Mixture of sawdust) supplemented with 30% wheat bran and 1% lime

A medium was prepared using different sawdust. With spawn preparing substrate; different supplements (at the different rate on dry weight basis) and $CaCO_3$ (1%) was added. The measured materials were taken in a plastic bowl and mixed thoroughly by hand and moisture was increased by adding water. The mixed substrates were filled into 9×12 inch polypropylene bag @ 200 g. The filled polypropylene bags were prepared by using plastic neck and plugged the neck with cotton and covered with brown paper placing rubber band to hold it tightly in place. Oyster mushrooms matured within 2-3 days after primordia

initiation. The matured fruiting body was identified by curial margin of the cap, as described by Amin (2002) [7]. Mushrooms were harvested by twisting to uproot from the base.

III. RESULTS AND DISCUSSION

The study was conducted to find out the effect of different sawdust substrate on the yield of oyster mushroom (*Pleurotus ostreatus*). The results have been presented and discussed under the following headings:

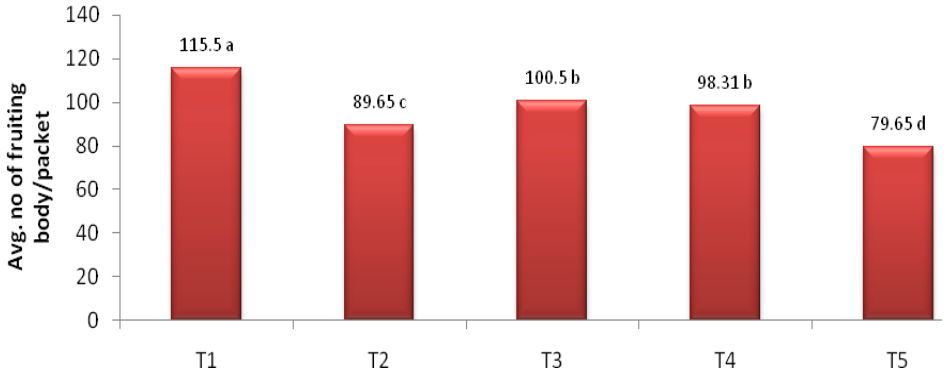
Average number of primordial/packet

T_1: Mango tree (*Mangifera indica*), T_2: Rain tree (*Albiia saman*), T_3: Teak tree (*Tectona grandis*), T_4: Mahogany tree (*Swietenia mahagoni*), T_5: Controled (Mixture of sawdust)

Figure 1. Performance of sawdust substrate on the average number of primordial/packet of oyster mushroom (*Pleurotus ostreatus*)

Statistically significant variation of average number of primordial/packet of oyster mushroom (*Pleurotus ostreatus*) showed due to different sawdust under the present trial (Figure 1). The highest average number of primordial/packet was observed in the treatment T_1 (217.5) and the lowest average number of primordial/packet was in the treatment T_5 (192.5). The result of the present findings keeps in with the findings of previous scientists [8.9.10]. Ahmed (1998) reported significantly different number of primordial on different substrates [8]. Dey (2006) found that the number of primordial and the average yield significantly varied with the substrates used in production of oyster mushroom [9]. Bhuyan (2008) found similar findings growing oyster mushroom on saw dust supplemented with different levels of cow dung [10].

Average number of fruiting body/packet

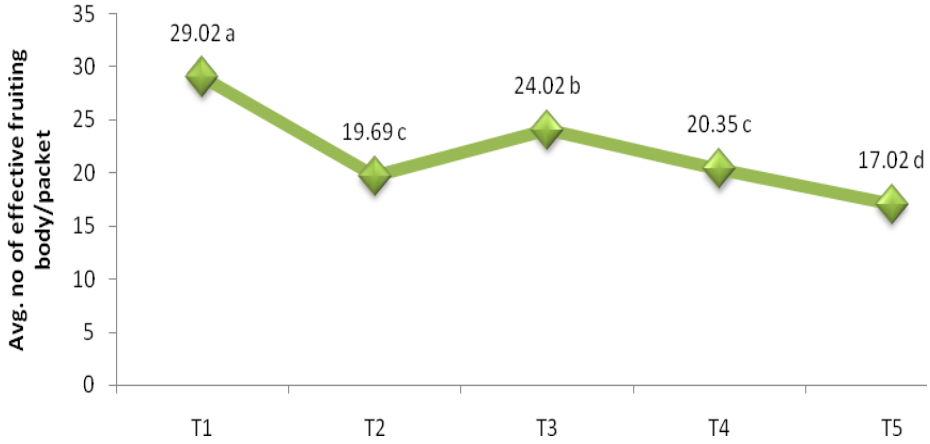


T_1: Mango tree (*Mangifera indica*), T_2: Rain tree (*Albiia saman*), T_3: Teak tree (*Tectona grandis*), T_4: Mahogany tree (*Swietenia mahagoni*), T_5: Controled (Mixture of sawdust)

Figure 2. Performance of sawdust substrate on the average number of fruiting body/packet of oyster mushroom

Statistically significant variation of fruiting body/packet of oyster mushroom *(Pleurotus ostreatus)* showed due to different sawdust under the present trial (Figure 2). The highest average number of fruiting body per packet was recorded from T_1 (115.5) while the lowest average number of fruiting body per packet was observed from T_5 (79.65) where T_3 (100.5), T_4 (98.31) are statistically similar. The result of the present findings keeps in with the findings of previous scientists [11, 12, 10]. Yoshida *et al.* (1993) reported that the number of fruiting bodies was lower, but increased when the substrates was mixed with different supplements [11]. Sarker, (2004) found that the number of primordial increased with the levels of supplement and continued up to a certain range and decline thereafter[12] . In the present study the average number of fruiting body in creased up to 10 % of cow dung used as supplement and decreased thereafter. Bhuyan (2008) in a same type of experiment found similar results [10].

Average number of effective fruiting body/packet

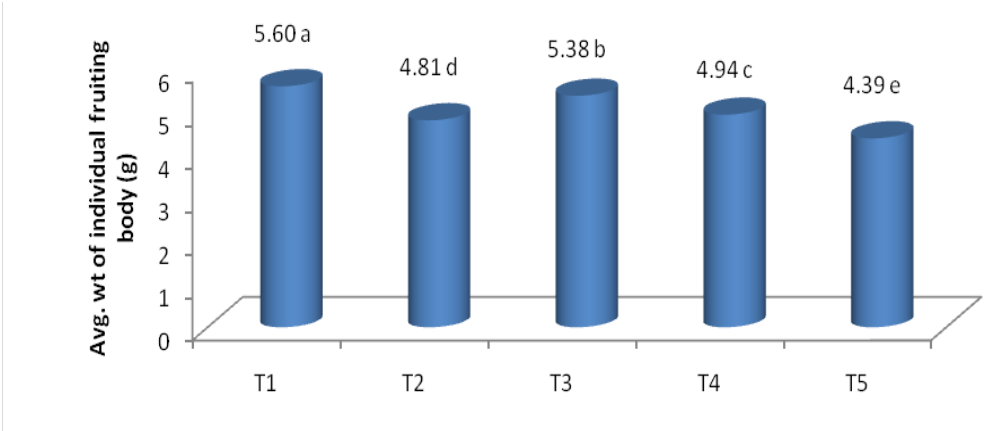


T_1: Mango tree (*Mangifera indica*), T_2: Rain tree (*Albiia saman*), T_3: Teak tree (*Tectona grandis*), T_4: Mahogany tree (*Swietenia mahagoni*), T_5: Controled (Mixture of sawdust)

Figure 3. Performance of sawdust substrate on the average number of effective fruiting body/packet of oyster mushroom (*Pleurotus ostreatus*)

The highest average number of effective fruiting body/packet was recorded from treatment T_1 (29.02), the lowest average number of effective fruiting body/packet was recorded from treatment T_5 (17.02). Statistically similar to T_4 (20.35) followed by T_2 (19.69) in terms of average number of primordial/packet (Figure 3). The result of the present findings keeps in with the findings of previous scientists [11] who reported that the no of fruiting body was low but increase when the substrate was mixed with different substrate.

Average weight of individual fruiting body (g)



T_1: Mango tree (*Mangifera indica*), T_2: Rain tree (*Albiia saman*), T_3: Teak tree (*Tectona grandis*), T_4: Mahogany tree (*Swietenia mahagoni*), T_5: Controled (Mixture of sawdust)

Figure 4. Performance of sawdust substrate on the average weight of individual fruiting body of oyster mushroom (*Pleurotus ostreatus*)

Statistically significant variation was recorded from average weight of individual fruiting body of oyster mushroom due to different sawdust substrate (Figure 4). The average weight of individual fruiting body in different treatment ranged from 5.60 g to 4.39 g. The highest average weight of individual fruiting body was recorded from treatment T_1 (5.60 g), the lowest average weight of individual fruiting body was recorded treatment T_5 (4.39 g). The other treatments varied significantly over control in terms of average weight of individual fruiting body (Figure 4). The present study matches with the study of the previous scientist [10]. Bhuyan (2008) found significant effect of supplementation on the weight of fruiting body but he found comparatively higher weigh of individual fruiting body ranged from (5.02g to 7.01g), which may be due to environmental conditions or growing season [10]. Erkel E. I. 2009 found that 30 minutes soaking was the best in relation to studied characters [13].

Biological yield (g)

Statistically significant variation was recorded from biological yield of oyster mushroom due to different sawdust substrate (Table 1). The highest biological yield was recorded from treatment T_1 (368.18 g), the lowest biological yield was recorded from treatment T_5 (316.28 g), which was statistically similar with T_3 (348.58 g) and T_4 (344.68 g) treatment. Baysal *et al.* (2003) found the highest yield of oyster mushroom (*Pleurotus ostreatus*) with the substrate composed of 20% rice husk in weigh [14]. Ruhul Amin *et al.* (2007) found the highest biological yield 247.3g/packet [15]. He also found that the trend of economic yield corresponded with different supplements at different level.

Table 1. Effect of different sawdust substrate on the yield of Oyster mushroom (*Pleurotus ostreatus*)

Treatment	Biological yield (g)	Economic yield (g)	Dry yield (g)
T_1	368.18 a	360.68 a	35.15 a
T_2	329.08 d	309.98 e	30.08 e
T_3	348.58 b	342.28 b	33.31 b
T_4	344.68 bc	338.28 bc	32.9 bc
T_5	316.28 e	322.98 d	31.38 d
$LSD_{(0.05)}$	7.009	7.193	0.718
CV (%)	1.13	1.18	1.18

Economic yield (g)

The highest economic yield was recorded under treatment T_1 (360.68 g) and the lowest economic yield was counted under T_2 (309.98 g). The other treatments varied significantly over control (Table 1), which was statistically similar with T_3 (342.28 g) and T_4 (338.28 g) treatment. Payapanon *et al.* (1994) mentioned that suitable amount of supplements added to sawdust medium maximized economic yield of oyster mushroom at optimum production cost [16]. Sarker (2004) found appreciable variations in economic yield also observed at different levels of supplements under different substrate-supplement combinations [12]. Bhuyan (2008) observed that the yield of *Pleurotus ostreatus* responded with the levels of supplements used with sawdust and increased with the level of supplementation and declined thereafter [10].

Dry yield

The dry yield of mushroom was maximum under the treatment T_1 (35.15 g) and the lowest dry yield was counted under T_2 (30.08 g). The other treatments were varied significantly over control (Table 1), which was statistically similar with T_3 (33.31 g) and T_4 (32.91 g). The result of the present study corroborates with Ahmed (1998) who observed significant effects of various substrates on diameter and length of stalk also diameter and thickness of pileus [8].

He also found that lower diameter of pileus produced the lowest yield and concluded that the diameter of pileus increased the quality and yield of mushroom and highest dry yield from mango sawdust. Sarker *et al*. (2007) found the range of dry yield from 4.28 g to 29.98 g, which was more or less similar to this study [4].

IV. CONCLUSION

From the above discussion, it was observed that treatment T_1 [mango tree sawdust + 30% wheat bran] among the treatments performed significantly better on yield of oyster mushroom *(Pleurotus ostreatus).*

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