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Full Length Research Paper

The effect of polythene colour container and three spawn rates on production of *Pleurotus ostreatus* mushroom

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To study the effect of polythene colour container and spawn rates on mushroom (*Pleurotus ostreatus*), experiment was carried out to investigate the cultivation on barely straws substrate. This cultivation system can improve the economic status of the farmer. Field experiment was conducted at College of Agriculture, University of Zabol during 2011 growing season. Experiment was carried out as factorial and based on completely randomized design (CRD) with three replications. Factors were different colour of polythene container (blue, yellow, transparent and green) and various levels of spawn (2.5, 4 and 5% wet weight substrate bases). There was significant difference in the yields from different spawn and colour of container maximum yield (weight of fresh mushrooms harvested at maturity) was obtained in 5% spawn rate (1248 g/2 kg wet substrate). Between colour polythene containers; maximum yield was obtained in green colour polythene (1366 g/2 kg wet substrate). The least of yield mushrooms were obtained from 2.5 % spawn rate and cultivation of mushroom in blue polythene container. It was concluded that the mushroom should be cultivated in green polythene bags under 5% spawn rate to achieve higher productivity.

Key words: Mushroom, spawn rates, yield, colour bags.

INTRODUCTION

Mushrooms are not only used for their flavor and nutritional value but also for their potential medicinal benefits. Owing to these qualities, large-scale production of mycelium and cultivation is very important in medicine (Veena and Pandey, 2006; Ogbonda, 2000; Nwanze et al., 2004). The protein content of mushroom varies between 27 and 48%, carbohydrates are approximately 60%, and lipids 2 to 8% (Morais et al., 2000).

Oyster mushrooms can be grown on agricultural and manufacturing waste. A large amount of oyster mushrooms can be produced from other land residue than waste, such as straws, leaves, and stems (Zadrazil, 1978). Oyster mushrooms are commonly grown on a spread range of ligninocellulosic elements (Poppe, 2000). There are various substrates that are known to stimulate fruiting. They include rice bran, cassava peels, and carbohydrates (Fasidi and Kadiri, 1993).

Generally, polythene bags of various colours are used for the production of mushrooms, though many mushrooms are known to require light to trigger morphogenesis (Theradimani et al., 2001). Dahmardeh et al. (2010) found out that the maximum average yield (1810 g/2 kg wet barely substrate) of mushrooms was estimated from the barley substrate at 150 g spawn level.

Therefore, this study was engaged to study the influence of colour of polythene containers on the growth of mushroom and determine the best ratios of spawn levels on the barely substrate for oyster mushroom cultivation.

MATERIALS AND METHODS

The research project was conducted in the Agriculture College, Department of Agronomy, University of Zabol, during the 2011 growing season. The filed experiment was carried out on the farm of the University of Zabol in Chah nimeh, Iran at an altitude of 483 m above sea level. Mushroom were cultivated in polythene bags (60 × 30 cm) on tiny barely straw. To determine the influence of colour on production, the polythene bags (poly bags) of blue, green, yellow and transparent colours were used as containers for mushroom cultivation. The substrates were soaked in water for 24 h

Table 1. Days for completion of spawn running, fruiting bodies formation and pinheads formation of different Ratio Spawn and Colours of poly bags.

Treatment	DCSR	DPF	DFBF
Spawn Ratio (%)			
2.5	21.6[a]	23.9[a]	26[a]
4	19.2[b]	21.1[b]	23.8[b]
5	17.2[c]	19.0[c]	23.3[c]
Colour of poly bag			
Blue	21.2[a]	23.1[a]	25.4[a]
Yellow	20[b]	22.1[b]	24.2[b]
Transparent	18.6[c]	20.4[c]	23.7[b]
Green	17.6[d]	19.7[d]	22.7[c]

Mean followed by the same letter within a column are not statistically different at the P = 0.05 level. DCSR, Days for completion of spawn running; DPF,days for pinheads formation; DFBF, days for fruiting bodies formation.

to moisten them thoroughly and were stalked on the steep cemented floor so as to remove the excessive moisture from the substrates to get 65 to 75% moisture level.

The bags were inoculated for spawn running under complete darkness at controlled temperature of 25°C. The temperature was controlled by electric heaters; 25°C for spawn running and 17 to 20°C for fruiting body formation. The humidity of bags was accomplished by spraying of water on them three times a day.

The fruit bodies were weighed immediately after harvest using electronic balance (Gostarsaz pand Co, And-ika = 5000i, Japan). The experiments were designed as 4 colours poly bag × 3 spawn ratios (2.5, 4 and 5%) factorials in completely randomized design (CRD) with three replications. The statistically analysis system (SAS) program was used to analysis data. The least significant range was used to separate treatments means (SAS, 1996). The yield of the fungus on the different colours and spawn ratio were determined by the weight of the fruit bodies produced. Biological efficiency was calculated using the below formula:

Biological efficiency (%) = Fresh weight of fruit body / Dry weight of substrate × 100

RESULTS AND DISCUSSION

Though there was significant difference ($p<0.01$) in yields obtained in response to colour of the polythene bags, the green poly bag (68.3% BE) performed marginally better compared to other treatments (60.2, 52.9 and 45.7 BE).
In general, the fungus took 17 to 21 days for completion of spawn running (DCSR), 19 to 23 days for pinheads formation (DPF) and 23 to 26 days for fruiting bodies formation (DFBF) (Table 1). The blue coloured polythene bags sustained relatively lower yield (914.1g) compared to other colours.

Spawn running (SR)

Increased spawn ratios resulted in decreased days of spawn running (Table 1). At a 2.5% spawn ratio, days to spawn running were 21 while 17 were observed for a spawn ratio of 5% spawn ratio (Table 1). Thus, increased in the spawn ratio from 2.5 to 5% resulted in a decreased in time to production of 4 days. These results agree with the finding of Royse et al. (2004).

Pricopei and Stan (2006) stated that increased spawn ratio showed a negative correlation between the spawn ratio and the number of the production days. The higher the spawn ratio was, the lower the number of the production days. The effect of colour of poly bags was significant and the best colour was green.

It is concluded from the investigation that mushroom should be cultivated in green polythene bags for achieving higher productivity. However, Theradimani et al. (2001) reported that growth chamber with blue coloured, significantly increased the yield of mushroom.

Pinheads formation (PF)

The pinheads formation is the second stage of mushroom growth during cultivation of fungi. Small pinheads like structures were observed; these pinheads were formed 2 to 8 days after the spawn running. These results are in agreement with Shah et al. (2004) who stated that *P. ostreatus* completed pinheads formation in 6 to 7 days after the spawn running. Increased spawn ratios resulted in decreased days to pinheads formation (Table 1).

At a 2.5% spawn ratio, days to pinheads formation were 23 while 19 were observed for a spawn level of 5% spawn ratio (Table 1). Thus, increase in the spawn levels from 2.5 to 5% resulted in a decreased in time to production of 4 days. The effect of colour of poly bags was significant and the best colour was green.

Fruiting bodies formation (FBF)

This is the final stage during the cultivation of mushroom.

Table 2. Biological efficiency and average yield of different spawn ratio and colours of poly bags.

Treatment	Weight of each fresh substrate(g)	Average fresh yield (g)	B.E (%)
Spawn ratio (%)			
2.5	2000	948	47.4
4	2000	1212.3	60.6
5	2000	1247.6	62.3
Colour of poly bag			
Blue	2000	914.1	45.7
Yellow	2000	1058.8	52.9
Transparent	2000	1204.8	60.2
Green	2000	1366.1	68.3

B.E %, (g fresh mushroom/g dry substrate) × 100; average fresh yield, g fresh mushrooms harvested at maturity.

The FBF appeared 4 to 5 weeks after inoculation. These findings are in conformity with Quimio (1976) who reported that fruiting bodies formation is 3 to 4 weeks after inoculation of spawn.

Increased spawn ratio resulted in decreased days to fruiting bodies formation (Table 1). At a 2.5% spawn ratio, days to FBF were 26 while 23 were observed for a spawn level of 5% spawn ratio (Table 1). Thus, increase in the spawn ratios from 2.5 to 5% resulted in a decreased in time to production of 3 days.

The effect of colour of poly bags was significant and the best colour was green. Days for fruiting bodies formation (DFBF) at the green colour was 22 days which is the least day for DFBF compared to the other colours (Table 1).

Yield and biological efficiency

Maximum average yield (1248 g) was estimated from the 5% spawn level (Table 2). So, it is recommended as a best spawn ratio for the cultivation of Oyster mushroom For all colours poly bags, increasing levels of spawn ratios resulted in yield increased. The biological efficiency was worked out against the dry weight of each substrate.
It is clear from Table 2 that 5% spawn ratio showed best B.E of 62.3% followed by 2.5% that was 47.4% (Table 2). The effect of colour of poly bags was significant and the best colour was green. This colour has the highest yield compared to other colours (Table 2).

It is concluded from the investigation that mushroom should be cultivated in green polythene bags for achieving higher productivity. However, Theradimani et al. (2001) reported that growth chamber with blue coloured of mushroom increased the yield of mushroom.

Pani (2011) recorded that transparent poly bag has the highest B.E (68.4%) compared to the other colours. Increasing spawn ratios is an important factor in simulating yield of *P. ostreatus*. This is not unexpected as other researchers have observed that yield increases as spawn ratios increase (Royse, 2002).

Yield increase may be due to increased level of nutrient available in spawn at higher rates and would provide more energy for mycelial growth. Using a spawn ratio of 5% led to obtaining high average yields (31.5%). When the spawn ratio was doubled, the average yield recorded was 1248 g of mushrooms.

It is concluded from the investigation that the mush-room should be cultivated in green polythene bags for achieving higher productivity.

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REFERENCES

Dahmardeh M, Dahmardeh M, Hossienabadi R, Safarpoor H, and Dahmardeh M (2010). Comparative study on cultivation and Yield performance of *Pleurotus ostreatus* (Oyster Mushroom) grown on different substrates (Wheat straw and Barley straw) and supplemented at various levels of Spawn. Int. J. Food Agric. Environ. 8(3&4): 996-998.

Fasidi IO, Kadiri M (1993). Use of Agric. wastes for the cultivation of *Lentinus subnudus (Polyporales: Polyporaceae*) in Nig. Revista Biol. Trop. 41(3): 411-415.

Morais MH, Ramos AC, Matos N, Santos-Oliveira EJ (2000). Production of shiitake mushroom (*Lentinus edodes*) on ligninocellulosic residues. Food Sci. Technol. Int. 6:123-128.

Nwanze PI, Khan AU, Ameh JB, Umoh VJ (2004). The effect of the interaction of various spawn grains with different oil rates on carpophore wet weights and stipe and pileus diameters of *Psathyrella atroumbonata*. Int. J. Sci. Technol. Res. 1(1&2): 103-111.

Ogbonda KH (2000). Amino acid composition of some edible wild mushrooms. Afr. J. Sci. Technol. (2): 153-157.

Pani BK (2011). Influence of Colour of Polythene Container and Incandescent Light on Production of White Summer Mushroom

(*Calocybe indica*). Res. J. Agric. Sci. 2(1): 153-155.
Poppe J (2000). Use of the agricultural waste materials in the cultivation of mushrooms. Mushroom Sci. 15: 3-23.
Pricope M, Stan NT (2006). Influence of four spawn rates on HK35 *Pleurotus* Mushroom yield and days to production. pp. 629-634.
Quimio TH (1976). Cultivation ganoderma the *Pleurotus*–way mushroom. Newsletter Tropics, 6: 12- 13.
Royse DJ (2002). Influence of spawn rate and commercial delayed release nutrient levels on *Pleurotus cornucopiae* (*Oyster mushroom*) yield, size and time of production. Appl. Microbial. Biotechnol. 58: 527-531.
Royse DJ, Rhodes TW, Ohga S, Sanchez JE (2004). Yield mushroom size and time to production of *Pleurotus cornucopiae*(Oyster mushroom) grown on switch grass substrate spawned and supplemented at various rates. Bioresour. Technol. 91: 85-91.
SAS Institute (1996). JMP. Start statistics. SAS. Institute statistical Analysis System, Carry, and NC.
Shah ZA, Ashraf M, Ishtiaq Ch M (2004). Comparative study on cultivation and yield performance of Oyster mushroom (*Pleurotus ostreatus*) on different substrates (Wheat straw, Leaves, Saw Dust). Pak. J. Nutr. 3(3): 158- 160.
Theradimani M, Meena B, Krishnamoorthy AS (2001). Innovative techniques for improvement of sporophore size and yield of milky mushroom (*Calocybe indica*). Mushroom Res. 10(1): 23-26.
Veena SS, Pandey M (2006). Evaluation of the locally available substrates for the cultivation of indigenous *Ganoderma* isolates. J. Mycol. Plant Pathol. 36(3): 434-438.
Zadrazil F (1978). Cultivation of *Pleurotus*. In: Change ST and Hayes WA (Ed). The biology and cultivation of edible mushroom Academic Press, New York, pp. 512-558.