

Growth Behaviour and Yield of Blue Oyster Mushroom on the basis of Various Spawn as well as Bed Substrates

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ABSTRACT

Oyster mushroom (*Pleurotus* sp) belonging to class Basidiomycetes and Family Agaricaceae is popularly known as 'dhingri' in India. It constitutes thirty percent of total production and ranks third among the cultivated mushrooms grown widely in temperate, tropical and sub-tropical regions of the world. *Hypsizygus ulmarius* is an edible mushroom, also known as elm oyster mushroom or blue oyster mushroom. It was introduced for commercial production for the first time in India by IIHR. The present investigation was undertaken during 2018-19 to evaluate the growth behavior and yield of blue oyster mushroom on the basis of various spawn as well as bed substrates. Among all the five grains tested, sorghum grain required the least days (14.50 days) for spawn run and mycelium is tightly attached with grains. Sorghum grain was considered as best treatment also in the context of yield and biological efficiency of 1539.50g/bed and 76.98% respectively. Among five different substrates, sugarcane bagasse took minimum time for spawn run (16.50 days) which significantly differs from other substrates and maximum time required for spawn run was observed in groundnut hulls (23.75 days). Minimum time required for pinhead emergence was in maize stalk (8.25 days). Paddy straw substrate gave the highest yield (1552.00g) as well as highest biological efficiency of 77.60%.

KEYWORDS

Hypsizygus ulmarius, spawn substrate, pinhead emergence, yield, biological efficiency

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INTRODUCTION

The mushrooms are fleshy, macroscopic fungi known for high food values since the historic period. It's a rich source of proteins, minerals and vitamins with no cholesterol. Among the cultural mushrooms, oyster mushroom is one of the edible mushrooms cultivated in tropics, sub tropics and temperate regions. Oyster mushroom (*Pleurotus* sp) belonging to class Basidiomycetes and Family Agaricaceae is popularly known as 'dhingri' in India. It constitutes thirty percent of total production and ranks third among the cultivated mushrooms. Elm oyster or blue oyster mushroom is a high yielding mushroom for which commercial cultivation practices have been released and gaining popularity. It grows saprophytically in nature with attractive color of fruit bodies. Blue Oyster is a novel species with a very large fruit body; blue colored pinheads become white on maturity. In India, the first time this blue oyster mushroom was grown was by Rai (2004). Thereafter, it was cultivated in Rajasthan by Doshi *et al* (2005) on wheat straw. Rotainh and Swargiary (1994) used different cereal grains viz., paddy, wheat, sorghum, pearl millet and maize for spawn production of *Pleurotus* spp. In view of this, the experiment was conducted to identify best spawn as well as bed substrates for mycelial growth and yield of *Hypsizygus ulmarius* in Odisha condition.

MATERIALS AND METHODS

The experiments were conducted during 2018-19 in CTMRT, department of Plant Pathology, College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha. Spawn of five different grains such as paddy, wheat, maize, bajra and sorghum was prepared by using a mother culture inside the laminar air flow chamber. Each bottle contains 200g spawn and before inoculation, the grains were sterilized in autoclave at 121°C temperature at 25 PSI for 2 hours. Mycelial growth in the spawn bottle was observed every day. After completion of spawn run in bottles containing different grains, those spawn were used to prepare mushroom beds where paddy straw was used as bed substrate. Days required for spawn run in each bed was observed. Each colonized bed was transferred into a growing room and various observations such as pinhead emergence, yield, biological efficiency etc were taken. Five different bed substrates such as paddy straw, maize stalk, maize cob and groundnut hull and sugarcane bagasse were used as five different treatments to obtain yield and other attributing characters. Bed substrates were cut into small pieces followed by soaking in water for 8-10 hours. Each treatment was replicated 4 times. Watering was done at regular intervals on the beds after spawn run and in similar manner various observa-

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tions such as pinhead emergence, yield, biological efficiency etc were recorded.

RESULTS AND DISCUSSION

In Odisha, cultivation of blue oyster mushroom has been started few years ago which performs well and hence a detailed study was carried out to investigate evaluation of growth behavior and yield of Blue Oyster Mushroom (*Hypsizygu* *ulmarius*) on the basis of various spawn as well as bed substrates. In this experiment, five different grains were used to study the growth behavior, yield and biological efficiency of *Hypsizygu* *ulmarius*. All five treatments were replicated four times to find out most suitable grains for spawn production. Observations regarding effect of spawn substrates on time required for spawn run and growth behavior of *H. ulmarius* is given in Table 1.

It was found that sorghum grain is most suitable for spawn production as it took the least days (14.50 days) for spawn run which is statistically at par with wheat and paddy grains which required 14.75 and 15 days for spawn run respectively and these findings corroborates the findings of Chauhan and Pant (1988), Chaurasia (1997) and Rathod *et al* (2002).

Observations regarding yield and other yield attributing characters are given in Tables 2 and 3 respectively.

Table 1: Effect of spawn substrates on time required for spawn run and growthbehaviour of *Hypsizygu* *ulmarius*

Treatment (Spawn substrates)	sub-	Time required for spawn run (day)	Growth characteristics
Wheat		14.75	Uniform growth in whole periphery of bottles and mycelium is tightly attached with grains
Pearl millet		21.50	Mycelia is loosely attached to grains, growth pattern is not uniform
Maize		19.50	Mycelia cover whole surface of grains, mycelia is tightly attached to grains
Sorghum		14.50	White cottony growth, also covered the neck of bottles
Paddy		15.00	Half of the grains are densely covered with mycelia while rest are loosely covered
S.E(m)±			0.40
C.D (P = 0.05)			1.23

Table 2: Effect of spawn substrates on yield and biological efficiency of *Hypsizygu* *ulmarius*

Treatment (Spawn substrates)	sub-	Yield(g)/ 2 Kg of substrates	Biological efficiency (%)
Wheat		1438.75	71.94
Pearlmillet		1469.75	73.49
Maize		1271.50	63.58
Sorghum		1539.50	76.98
Paddy		1115.25	55.76
SE(m)±			38.75
C.D (P = 0.05)			120.71

Results revealed that spawn with sorghum grains as substrate gave the highest yield of 1539.50g/bed with a biological efficiency of 76.98% which was found the best treatment. These findings are in close agreement with the findings of Sivaprakasam and Kandaswamy (1981) as well as Rangad and Jandaik (1977) who also reported sorghum grains to be the best, giving maximum yield of different *Pleurotus* species. Results presented in Table 3 revealed that minimum days required for spawn run in paddy straw substrate was obtained in case of wheat grain. However, substrates spawned with sorghum grains took least time for pinhead formation (6.25 days). In the case of obtaining the largest pileus size (88.08mm) and stalk diameter (13.90mm), paddy grains performed best. Maximum stipe length was recorded in maize grains (33.10 mm) which is statistically at par with paddy (30.38mm) and sorghum grains (28.50 mm).

To investigate the effect of substrates, five different substrates were used to observe growth behavior, yield and biological efficiency of *Hypsizygu* *ulmarius*. Data representing yield attributing characters are given in Table 4 whereas analysis of yield and biological efficiency was represented in Table 5 .

Results presented in Table 4 showed that minimum days required for spawn run was obtained in sugarcane bagasse (16.50 days) followed by paddy straw (21.25 days). Similar findings were also supported by Sharma *et al* (2013) who reported paddy straw to be the best substrate followed by sugarcane bagasse compared to other substrate. However it was noticed that maize stalk required minimum time for pin head emergence (8.25 days).

Table 3: Effect of spawn substrates on yield attributing characters of *Hypsizygus ulmarius*

Treatments (Spawn substrates)	Days required for spawn run	Days required for pinhead formation	Morphological characteristics (mm)		
			Pileus size	Stipe length	Stipe diameter
Wheat	17.75	8.25	70.48	12.35	9.43
Pearl Millet	22.00	9.38	68.45	21.25	8.80
Maize	20.50	7.25	79.25	33.10	12.98
Sorghum	21.75	6.25	77.75	28.50	13.05
Paddy	22.25	8.00	88.08	30.38	13.90
SE(m)±	0.59	0.38	3.54	3.67	1.24
C.D (P=0.05)	1.84	1.18	11.03	11.45	3.87

Table 4: Effect of Various substrates on yield attributing characters of *Hypsizygus ulmarius*

Treatment (substrates)	Days required for spawn run	Days required for pinhead emergence	Morphological characteristics (mm)		
			Pileus size	Stipe length	Stipe diameter
Maize stalk	22.50	8.25	59.53	15.15	14.81
Sugarcane bagasse	16.50	13.50	60.28	16.25	8.00
Groundnut hulls	23.75	12.50	54.68	15.35	7.50
Maize cobs	23.25	10.00	74.78	26.97	6.98
Paddy straw	21.25	12.00	68.98	21.08	9.43
SE(m)±	0.73	1.04	4.05	2.19	0.74
C.D (P=0.05)	2.26	3.24	12.61	6.82	2.32

Table 5: Effect of various substrates on yield and biological efficiency of *Hypsizygus ulmarius*

Treatment (substrates)	Yield (g)/ 2Kg substrate	Biological efficiency (%)
Maize stalk	1320.25	66.01
Sugarcane bagasse	1191.25	59.56
Groundnut hulls	952.50	47.63
Maize cobs	1085.75	54.29
Paddy straw	1552.00	77.60
SE(m)±	38.75	
C.D (P = 0.05)	120.71	

On the contrary, Baghel (2017) reported that paddy straw required minimum time for pinhead initiation. Largest pileus size (74.78 mm) and longest stipe (26.97) was observed in those fruiting bodies which were grown in maize cob. Stipe diameter was more in case of those fruiting bodies which were cultivated in maize stalk (14.81). Shendge *et al* (2019) reported maximum stipe length, stipe diameter and pileus on sugarcane bagasse followed by maize stalk. Highest yield

1552.00g /2 kg substrates and biological efficiency 77.60% was recorded in paddy straw substrate given in table 5. Paddy straw was demonstrated as the most suitable substrate by so many workers while performing with different species of *Pleurotus* (Borkar *et al*, 2014).

CONCLUSION

Hypsizygus ulmarius gaining popularity in Asia and Europe owing to its simple and low-cost production technology and higher biological efficiency. During the present course of investigation, various experiments were conducted to evaluate the newly introduced species *Hypsizygus ulmarius* in the East and South-Eastern coastal plain zone of Odisha in terms of yield and other associated attributes. It was also found that Sorghum grain is the best treatment when considered in the context of yield and biological efficiency. Among 5 different substrates, paddy straw substrate gave highest yield (1552.00g) as well as highest biological efficiency i.e. 77.60. Therefore, paddy straw was considered as best bed substrate for cultivation of *Hypsizygus ulmarius*.

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