International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(6): 1368-1370

Received: 04-09-2019
Accepted: 06-10-2019

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Effect of prevailing environment condition on growth and yield of *Hypsizygus ulmarius*

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Abstract
Blue oyster mushroom is a novel species with very large fruit body, blue colored pinheads becoming light white on maturity, high yielder, palatable with meaty flavor and attractive keeping quality. This new mushroom variety has attractive shape and fleshy with excellent taste. The present investigation was under taken to find out the prevailing environmental conditions for growth and yield of *H. ulmarius*. The experiment was conducted in October 2016 to April 2017 on wheat and paddy straw substrate separately and standard for cultivation procedure was adopted. Maximum yield was observed during the month of December. when the minimum, average and maximum temperatures (20.56 ºC, 20.08 ºC, and 20.76 ºC respectively) 83.16%(morning) to 85.90% (evening) relative humidity prevailed in the cropping room with biological efficiency 112.00% on wheat straw and 101.87% on paddy straw.

Keywords: Blue oyster mushroom, fruit body, pinheads, *H. ulmarius*, substrate, temperatures, relative humidity, biological efficiency

Introduction
H. ulmarius (elm oyster mushroom) is a high yielding mushroom for which commercial cultivation technology has been released and is gaining popularity, it is widely cultivated throughout the world mostly in Asia and Europe owing to their simple and low cost production technology and higher biological efficiency (Mane *et al.*, 2007) [6]. In Chhattisgarh blue oyster mushroom first time cultivated by Annon (2005) [1]. But the data pertaining to influence of prevailing environmental conditions on growth and yield of *H. ulmarius* are very meager. It grows saprophytically in nature with attractive colour of fruit bodies. This mushroom is named "Blue oyster mushroom" because of colour and tongue shaped pileus with an eccentric lateral stipe. This mushroom has a wide uses due to its unique flavour, nutritive value and medicinal properties. Nutritionally, this mushroom contains 23.6% protein, 2.2% fat, 52.4% carbohydrates and 12.9% fiber on dry weight basis. Medically it is known for their cardiovascular, anti-tumor and cholesterol controlling properties. Taxonomically, it is placed in Phylum-Basidiomycota Class-Basidiomycates, subclass–Agaricomycatideae, order–Agaricales and Family-Tricholomataceae (Kirk *et al.*, 2001) [5].

Materials and methods
To know the effect prevailing environmental conditions, on the growth and yield of blue oyster mushroom (*H.ulmarius)* was studied on wheat and paddy straw substrate from October 2016 to April 2017. The spawning was done on first week of every month by layer method @ 4% w/w basis. Spawned straw (0.5kg dry straw /bag) was filled in poly propelene bags and transferred to cropping room at the existing environmental conditions. Observation on period for spawn run and yield were recorded for both substrates. Eight replications were maintained for each substrate throughout the study period.

Results and discussion
The effect of prevailing environmental conditions on spawn run and yield of *H. ulmarius* was studied on paddy straw substrate. The period required for spawn run by *H. ulmarius* during different months (October 2016 to April 2017) differed significantly with respect to different months of spawning. Spawn run period was significantly less recorded during March and January (21.25 and 22 day respectively). while it was more noticed in October (30.0 days). During October 2016 to February 2017 environmental condition like temperature (maximum 20.76 to 28.43, minimum 20.56 to 26.51 and average 20.08 to 27.47 ^{0}C) and 66.71

to 86.98% relative humidity prevailed in the cropping room. However, during March and April 2017 maximum, minimum, temperature and relative humidity (25.91-34.08 ^{0}C, 25.91-37.88 ^{0}C, 25.90-35.98 ^{0}C and 53.35-40.44% respectively) was exist in the mushroom growing room. Significantly earlier primordial formation was noticed in the month of October (2.75 days) and next were November (2.88 days), January (2.88 days), December (3.00 days) while it was significantly delayed in April and February month (3.88 and 3.75 days respectively). The fresh yield of *H. ulmarius* significantly more recorded in December, (509.13g) as compared to other months while it was significantly less recorded in April (357.38g) and March 2017 (366.68 g) and at par with each other. In October, November, January and February months did not differ significantly and it ranged from 420.5-444.38 g. The biological efficiency was in accordance with that of yield and ranged from 71.47 to 101.47 percent.

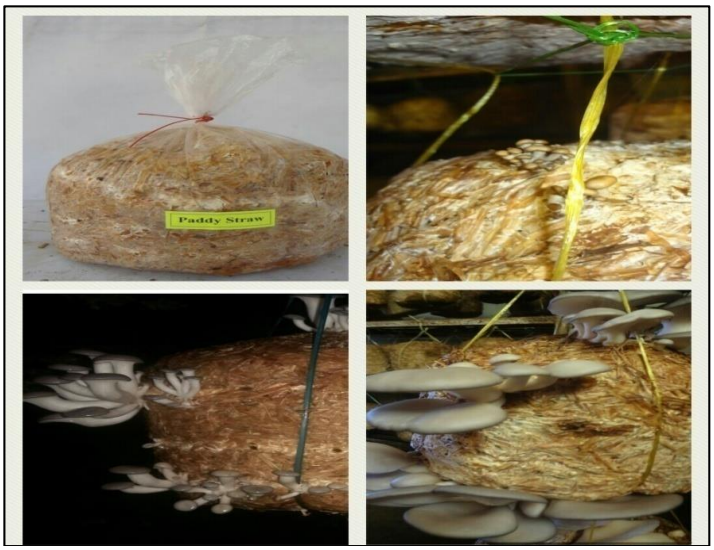

Fig: Growth and yield of *H. ulmarius* on paddy straw

Fig: Growth and yield of *Hypsizygus ulmarius* on wheat straw

Table: Influence of prevailing environmental conditions on growth and yield of *H. ulmarius* on paddy straw

Month	Temperature (^{O}C)			Relative humidity (%)			Spawn run (Days)	Primordial initiation (Days)	Yield (g.)*	B.E. (%)
	Min	Max	Average	Min	Max	Average				
October	26.51	28.43	27.470	80.67	93.3	86.98	30.00	2.75	430.00	86.00
November	22.54	22.91	22.595	76.73	77.4	77.01	22.63	2.88	444.38	88.875
December	20.56	20.76	20.080	83.16	85.9	81.80	22.75	3.00	509.13	101.825
January	21.04	22.56	21.030	65	66.3	76.25	22.00	2.88	423.75	84.75
February	21.76	21.90	21.830	64.42	69	66.71	23.00	3.75	420.50	84.1
March	25.91	25.89	25.900	53.12	53.58	53.35	21.25	3.50	366.88	73.375
April	37.88	34.08	35.980	41.63	39.26	40.44	22.88	3.88	357.38	71.475
SEm±							0.302	0.272	14.797	
CD (5%)							0.861	0.775	42.180	

* Average of eight replication

The effect of prevailing environmental conditions on spawn run and yield of *H. ulmarius* was studied on wheat straw substrate

The period required for spawn run by *H. ulmarius* during different months (October 2016 to April 2017) differed significantly with respect to different months of spawning. Spawn run period was significantly less recorded during March and January (21.50 and 20.75 day respectively).while it was more noticed in October (25.00 days). During October 2016 to February 2017 environmental condition like temperature (maximum 20.76 to 28.43, minimum 20.56 to 26.51 and average 20.08 to 27.47 ^{0}C) and relative humidity 66.71 to 86.98% prevailed in the cropping room. However, during March and April 2017 maximum, minimum, temperature and relative humidity (25.91-34.08 ^{0}C, 25.91-37.88 ^{0}C, 25.90-35.98 ^{0}C and 53.35-40.44% respectively) was exist in the mushroom growing room. The fresh yield of *H. ulmarius* significantly more recorded in December, (560.00g) and November (509.38g), while it was significantly less recorded in April 2017 (369.38 g) and March (374.63 g) at par with each other. In other month it varied from 428.75 to 490.63 g. The biological efficiency was in accordance with that of yield and ranged from 73.87 to 112 percent. During November, October and January months has no significant difference in yield and it varied from 490.63 to 509 g.

In the present investigation maximum fresh yield was recorded in the minimum (20.56 ^{0}C) and maximum (22.91 ^{0}C) and relative humidity (76.01-81.08%) prevent in cropping room. In the month of March and April minimum – maximum temperature (25.89-37.88 ^{0}C) and relative humidity (39.26-53.8%) was recorded in cropping room. which are conformity with results Anon (2007) who reported 17-25 ^{0}C and 55-71% relative humidity to be more suitable for obtaining higher yield of *H. ulmarius*. Similarly Anon (2006) [2] also found good yield of *H. ulmarius* during October months. Earlier spawn run and higher yield of *P. columbinus* during January month was also reported by Chaurasia (1997).When minimum temperature (13.93-20.62 ^{0}C), maximum temperature (23.57-28.16 ^{0}C) and relative humidity (76.38-84.34%) prevailed in cropping room.

Table: Influence of prevailing environmental conditions on growth and yield of *Hypsizygus ulmarius* on wheat straw

Month	Temperature (^{O}C)			Relative humidity (%)			Spawn run (Days)	Primordial initiation (Days)	Yield (g.)*	B.E. (%)
	Min	Max	Average	Min	Max	Average				
October	26.51	28.43	27.47	80.67	93.30	86.98	25.00	3.13	463.25	92.65
November	22.54	22.91	22.59	76.73	77.40	77.01	21.75	2.88	509.38	101.87
December	20.56	20.76	20.08	83.16	85.90	81.80	22.50	2.38	560.00	112.00
January	21.04	22.56	21.03	65.00	66.30	76.25	20.75	2.63	490.63	98.12
February	21.76	21.90	21.83	64.42	69.00	66.71	22.50	3.13	428.75	85.75
March	25.91	25.89	25.90	53.12	53.58	53.35	21.50	3.00	374.63	74.92
April	37.88	34.08	35.98	41.63	39.26	40.44	23.13	3.63	369.38	73.87
SEm±							0.86	0.23	17.83	
CD (5%)							0.30	0.67	50.83	

*Average of eight replication

Conclusion

The present investigation “Studies on blue oyster mushroom (*Hypsizygus ulmarius*) in Chhattisgarh.” was undertaken in the Mushroom Research laboratory Department of Plant Pathology, Collage of Agriculture, I.G.K.V., Raipur.Highest yield of *H. ulmarius* was obtained of paddy straw in month of December and December on wheat straw.

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