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Effect of Different Light Colours on Theyield and Yield Contributing Parameters of Blue Oyster Mushroom, (*Hypsizygus Ulmarius*) Bull Ex.Fr. in Marathawada Region

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ABSTRACT
Among different light used for production of H. ulmarius, minimum period (15, 20 and 24 days respectively) was required for completion of spawn run, pinhead initiation and for maturing fruiting bodies on control (without any exposure to artificial light) and it was closely followed by blue light, yellow light, grey light and CFL on soybean substrate. Maximum days (17, 22 and 27) were required for completion of spawn run, pinhead initiation and for maturing fruiting bodies for orange light, red light and fluorescent tube. Highest pileus diameter, stipe diameter and stipe length were recorded on control. Maximum fresh weight and dry weight (1369.6g and 174.19g respectively) were recorded on controland it was closely followed by blue light and transparent light. Maximum moisture content (89.60%) was recorded on red light. Maximum yield and biological efficiency was recorded on control. Minimum yield and biological efficiency (117.40g and 75.34% respectively) was recorded on control.
Key words *:- Different Light, Hypsizygusulmarius, yield, Moisture, BE.*

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INTRODUCTION

Edible and medicinal properties of mushrooms were known to many ancient civilizations. Only the reproductive structure comes out of the substrates and forms a fruiting body which is visible, called "mushroom" which may be edible. Most of the edible mushrooms belong to Ascomycotina and Basidiomycotina [5]. The mushroom cultivation is a profitable agribusiness and particularly oyster mushroom which is edible having excellent flavour and taste [6]. Growing oyster mushroom has become more popular throughout the world, because of their abilities to grow at a wide range of temperature utilizing various lingo-cellulosic substrates [3, 7]. *Hyspizygus* is one of the edible mushroom generally referred as "Oyster mushroom or Dhingri mushroom" in India. It relatively new to the mushroom industry but has gained popularity at a tremendous pace and today it is the third largest cultivated mushroom in the world and its annual production is around 8,75,000 tons. Considering obvious potentialities of *Hypsizygus*, an experiment was designed to ascertain the effect of different light colours on the yield and yield contributing parameters such as time required for completion of spawn run, pinhead initiation and for maturing fruiting bodes, fresh and dry weight of mushroom and moisture percentage and biological efficiency of the mushroom were evaluated.

MATERIALS AND METHODS

The pure culture of *H. ulmarius* was obtained from All India Coordinated Mushroom Research Centre, College of Agriculture, Pune, multiplied and maintained on PDA medium and used for the production of master spawn, from which commercial wheat grain spawn was produced, applying the standard methodology. [3]

BAG FILLING, SPAWNING AND INCUBATION

The transparent polybag system of oyster mushroom cultivation was employed [3]. The candiscent light bulbs Viz., blue, orange, yellow, grey, transparent, white, red, fluorescent, CFL and natural light sources were assessed.(Table 1). In a plastic drum (cap. 200 lit.), about 90 lit. of clean tap water was filled to

which 10-12kg dry soybean straw was separately steeped. In a plastic bucket, carbendanzim (50wp) @ 7.5 g+ Formaline (37-40%) @125 ml were thoroughly mixed with 10 lit. water and this solution was slowly poured into the soybean straw steeped in the drum and kept as such overnight. On the next day morning, the straw was taken out, foiled into clean gunny bags and kept on raised platform to drain out excess water. This pre-soaked and chemically sterilized straw was used immediately for polybag filling. Transparent polythene bags of the size 35×55 cm^2 (100 guage thickness) sterilized with formaline @4% solution were used, of which lower corners were tied with the string so that the bed assumes a round shape after filling the straw. The processed straw was filled to these sterile polythene bags by multilayer spawning (spawning @ 2% of wet weight of the straw / substrate). The bags were filled upto 90% of their capacity, close their opening end tightly with the thread and with sterilised needle, about 20-25 minutes holes all around the filled bags were made.

Spawned substrate bags were incubated for spawn run in the room equipped with separate chambers and provide with the bulbs of various light colours and light sources. In this chambered room, the temperature and humidity were maintained around 20-25 °C and 70-80%, respectively with poor ventilation. For each treatment, 5 spawned beds per replication were maintained. The spawned beds kept in the room under natural light were maintained as under control. The experiment was planned with the CRD and all the treatment replicated thrice (Table 1). After completion of spawn run, the bags were removed by cutting longitudinally with sharp blade and these beds were kept under the artificially prepared compartments.In the cropping room where the temperature of 25-30°C and relative humidity 80-90% were maintained. Observations on vegetative growth parameters, yield contributing parameters, fresh fruiting body yield, dry weight of mushroom and biological efficiency were recorded at stipulated durations.

RESULT AND DISCUSSION

The results obtained on the effect of various light colours and its sources on the parameters *viz*., days to spawn run, days to pinhead initiation, average numbers of pinheads, days to formation of matured fruiting bodies/ bed, stipe length, stipe and pileus diameter, fresh yield, dry weight and biological efficiency of *H. ulmarius* were recorded from time to time and the data obtained are presented in table 1-3.

Days required for completion of spawn run: The data recorded with regard to influence of light colours on the number of days required for completion of spawn run presented in table 1. The number of days for completion of spawn run was ranged between 15.00 to 17.00.

Table 1. Effect of various light colour on vegetative and reproductive growth of *H.ulmarius.*

Tr.No.	Treatments	Days required *for		
		Spawn run	Pinhead initiation	MFB
T1	**Blue**	15	20	24
T2	**Orange**	17	22	27
T3	**Yellow**	15	20	25
T4	**Grey**	15	19	24
T5	**Transparent**	16	20	26
T6	**White**	16	22	27
T7	**Red**	17	22	27
T8	**Fluorescent tube**	16	23	28
T9	**CFL**	16	20	24
T10	**Control**	15	20	24

*: Average of three replications, Bed : 1.5kg dry substrate/bed

Table 2.Effect of different light on number of pinheads, matured fruiting bodies and size of pileus and stipe in *H. ulmarius.*

Tr. No.	Treatments	Av. Number *of		Av. Size**of		
		Pinheads	MFB	Pileus Dia. (cm^2)	Stipe Dia. (cm^2)	Stipe length (cm^2)
T1	Blue	263.33	244.67	7.53 (15.92)	3.66 (11.03)	7.7 (16.10)
T2	Orange	203.00	183.00	7.26 (15.63)	3.60 (10.93)	6.56 (14.84)
T3	Yellow	205.00	184.00	7.43 (15.81)	3.73 (11.12)	6.50 (14.76)
T4	Grey	226.33	206.33	7.30 (15.67)	3.50 (10.78)	6.46 (14.73)
T5	Transparent	247.67	225.64	6.70 (14.99)	4.16 (11.77)	7.63 (16.03)
T6	White	245.67	226.00	6.60 (14.88)	3.73 (11.13)	6.90 (15.22)
T7	Red	175.33	158.33	5.53 (13.60)	3.36 (10.57)	5.53 (13.60)
T8	Fluorescent	181.67	167.33	5.50 (13.56)	3.96 (11.48)	6.76 (15.07 (15.07)
T9	CFL	235.00	208.67	5.80 (13.93)	4.33 (12.01)	6.40 (14.65)
T10	Control (without any exposure of artificial light)	276.00	252.67	8.16 (16.60)	4.36 (12.05)	8.66 (17.11)
S.E.±		**2.72**	**3.07**	**0.13**	**0.18**	**0.12**
C.D.1%		**10.94**	**12.36**	**0.54**	**0.76**	**0.51**
C.V.		**2.09**	**2.58**	**1.53**	**2.90**	**1.46**

*: Average of three replications, ** : Average of ten fruiting bodies.

Table 3. Effect of different light on yield, dry weight, moisture content and biological efficiency (B.E.) of *H. ulmarius*.

Tr. No.	Treatments	Yield (g/bed)*	Dry Weight (g)*	Moisture (%)*	B.E. (%)*
T1	Blue	1353.60	168.59	87.54 (69.32)	90.24 (71.79)
T2	Orange	1267.20	130.54	89.22 (70.82)	84.47 (66.79)
T3	Yellow	1289.1	136.21	89.43 (71.01)	85.94 (67.97)
T4	Grey	1335.6	146.86	89.33 (70.93)	89.00 (70.63)
T5	Transparent	1352.2	166.25	87.70 (69.46)	90.13 (71.69)
T6	White	1347.2	157.53	88.30 (69.99)	89.81 (71.38)
T7	Red	1129.8	117.40	89.60 (71.18)	75.34 (60.22)
T8	Fluorescent	1175.6	130.39	88.90 (70.53)	78.36 (62.27)
T9	CFL	1351.0	148.38	88.86 (70.49)	78.86 (70.50)
T10	Control (without any exposure of artificial light)	1369.6	174.19	87.28 (69.09)	91.29 (72.85)
S.E.M. ±		**2.79**	**2.73**	**0.16**	**0.41**
C.D.1%		**11.23**	**11.00**	**0.66**	**1.65**
C.V.		**3.72**	**3.19**	**0.40**	**1.03**

***:Mean of three replications, B.E.: Biological efficiency, Bed : 1.5 kg dry substrate**

****: Figures in parenthesis are angular transformed values.**

Result indicated that significantly minimum time (15 days) required for spawn run by mycelium of *H. ulmarius* was recorded on blue colour light and it was similar with yellow colour light, Grey colour light and on control bed (each of 15 days). Maximum time (17 days) required for completion of spawn run was on red and orange coloured light followed by transparent colour light, white coloured light, fluorescent colour tube and CFL bulb (each of 16.00 days).

Days required for pinhead initiation : After the complete colonization of the substrate beds were kept for fruiting. The number of days required for initiation of pinheads was ranged between 19-24 days. It is obvious from the table that minimum time for initiation of pinheads (19.00 days) was taken by grey light and was closely followed by blue colour light, transparent colour light yellow colour light and CFL bulb (each of 20.00days). Maximum number of days (23.00) required for pinhead initiation was recorded on fluorescent tube and this was followed by red colour light, white colour light and orange colour light (each of 22.00days).

Days required for matured fruiting bodies : The number of days required for matured fruit bodies ranged between 24.00- 28.00 days. The minimum number of days (24.00 days) required for matured fruiting bodies was recorded on the blue colour light, grey colour light and CFL bulb and control (without any exposure of artificial light) (each of 24.00 days). Maximum number of days required for matured fruiting bodies was recorded on fluorescent tube (28.00days) and it was closely followed by orange colour light, white colour light and red colour light (each of 27 days).

Average number of pinheads/bed : The average number of pinheads of *H. ulmarius* in present investigation ranged between 175.33- 276.00. Minimum average number of pinheads /bed (175.33) were recorded in treatment which received red light colour. It was followed by fluorescent tube light (181.67), orange light colour (203.00) and yellow light colour (205.00) which was at par with each other. Maximum numbers of pinheads (176.00) were recorded on control (without any exposure to artificial light) followed by blue light colour (263.33), transparent light colour (247.67), white light colour (245.67) and grey colour light (226.33).

Average number of matured fruiting bodies : It is revealed from Table 2 the effect of light colours on average number of fruiting bodies of *H. ulmarius*. The average number of matured fruiting bodies of *H. ulmarius* in present investigation ranged between 158.33 -252.67. The mean data revealed that maximum average number of fruiting bodies (252.67) were obtained in control (without any exposure to artificial light). It was at par with blue colour of light (144.67). Minimum average number of matured fruiting bodies were obtained from red light colour (158.33) and was followed by fluorescent tube (167.33), orange light colour (183.00) and yellow light colour (184.00).

Average diameter of pileus (cm^2) :- The average pileus diameter of *H. ulmarius* on different light colours was recorded in between 5.53-8.16 cm^2. The highest average pileus diameter (8.16 cm^2) was recorded on control (without any exposure to artificial light) followed by blue light colour (7.53 cm^2) followed by yellow light colour (7.43 cm^2) and grey light colour (7.30 cm^2). Minimum average diameter of pileus was recorded on treatment which received red light colour (5.53 cm^2) followed by fluorescent light (5.50 cm^2).

Average diameter of stipe (cm2) : Table 2 revealed that the effects of different light colours on the average diameter of stipe of *H. ulmarius.*The average diameter of stipe of *H. ulmarius* in present investigation ranged between 3.36-4.36 cm^2. Maximum average diameter of stipe (4.36 cm^2) was recorded in treatment with control (without any exposure to artificial light) which was at par with blue light (3.66 cm^2) and orange light colour (3.60 cm^2). It was closely followed by CFL (4.33 cm^2), transparent light colour (4.16 cm^2). Minimum average diameter of stipe (3.3 cm^2) was recorded in the treatment which received red light colour which was closely followed by grey light colour (3.50 cm^2).

Average length of stipe (cm^2) : In the present investigation average length of stipe of *H. ulmarius* ranged between 6.40-8.66 cm^2. The highest average length of stipe (8.66 cm2) was recorded on control (without any exposure to artificial light) which was closely followed by blue light colour (7.70 cm2), transparent light (7.63 cm2). The minimum average stipe length was recorded on red light colour (5.53 cm2) followed by CFL bulb (6.40 cm2).

Fresh yield of mushroom: The results regarding the effect of different light colours on average yield of *H. ulmarius* are given in table 3 revealed that the effect of light colours on the yield of fruiting bodies of *H. ulmarius.* The fresh yield of test mushroom on different light colours was ranged from1129.8-1369.6 g / 1.5 kg dry substrate. In the present investigation the maximum fresh weight of mushroom *H. ulmarius* was recorded in treatment control (without any exposure to artificial light) and that was closely followed by treatment which received blue light colour (1353.60 g) transparent light colour (1352.3 g), CFL bulb 1351.0 g), white light colour (1347.2 g) and grey light colour (1335.6 g). Minimum fresh yield was recorded on the treatment which received red light colour (1129.8 g) followed by fluorescent bulb (1175.6 g).

Average dry weight of mushroom : As evident from Table 10, the influence of light colours on average dry weight of *H. ulmarius* and result revealed that average dry weight of mushroom ranged between 117.40 g- 174.19 g. Maximum dry weight of mushroom was recorded in the treatment of control (without any exposure to artificial light) that was at par with blue light colour (168.59 g) was and transparent light (166.25 g). Minimum dry weight of mushroom was recorded on red light colour (117.40 g) followed by fluorescent light (130.39 g) and orange light (130.54 g).

Moisture content of mushroom : The effect of different light colours on moisture content of *H. ulmarius* were observed and recorded in Table 3. Moisture content of *H. ulmarius* was ranged between 87.28 %- 89.60 %. Maximum moisture content in *H. ulmarius* was recorded in the treatment which received red light colour (89.60 %) followed by yellow light colour (89.43 g), grey light colour (89.33 %) and orange light colour (89.22%). Minimum moisture content was recorded in the control treatment (without any exposure to artificial light) (87.28 %) which was closely followed by blue light colour (87.54 %) and in transparent light colour (87.70 %).

Biological efficiency of mushroom : Biological efficiency of *H. ulmarius* cultivated in different light colours were presented in table 3. It was necessary to calculate percentage of BE because certain substrates were denser than the others. The conversion percentage from dry substrate weight to fresh mushroom weight (biological efficiency) was determined. Biological efficiency of *H. ulmarius* was ranged between 75.34- 91.29 per cent and showed in Table 3.The highest biological efficiency was recorded in the treatment with control (91.29 %) which was closely followed by blue light colour (90.24 %), and transparent light colour (90.13 %). Minimum biological efficiency was recorded in the treatment which received red light colour (75.34 %) followed by fluorescent light (78.36 %) and CFL bulb (78.86 %).

Above findings are in agreement with Furlon *et. al*., [2]; Chandravanshi [1]; Yasumasa (2011); Shendge [8]. Jatav [4] reported growth of *H. ulmarius* was better total dark followed by natural diffused light.

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