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# Studies on effect of incubation temperature and light intensity on mycelial growth of oyster species

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**ABSTRACT**

*The investigation on the influence of incubation temperature on the linear mycelial growth of oyster species showed that the growth at 25°C was superior and could produce an ample biomass of eight of the ten species evaluated. The extent of mycelial growth reduced drastically beyond the incubation temperature of 3 °C and was completely inhibited at a temperature of 40whereas,at low temperature(10°C) growth declined drastically in all the test species. The effect of different light intensity on the mycelial growth of ten oyster species indicated the superiority of 200 lux light is producing the highest linear mycelial growth of all the test species (63.92-78.89mm).The growth was observed to decline substantially (21.79-51.66mm) as the light intensity improved from 200 -1000lux. However, growth performance was found moderate(48.38-57.77mm) in darkness.*

***Keywords*:** Light intensity, mycelial growth, oyster mushroom, temperature

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 (Pathak *et al*., 2003). The mushroom cultivation is a profitable agribusiness and particularly oyster mushroom which is edible having excellent flavour and taste (Shah *et al*., 2004). 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 (Khan and Garcha 1984). *Pleurotus* 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 *Pleurotus*, an experiment was designed to ascertain the effect of temperature and light intensity on the mycelial biomass of the species of fungus under laboratory condition for improving standardization of production techniques for increasing yield.

## MATERIALS AND METHODS

The experiment on light intensity was conducted to ascertain the effect of different light intensities such as complete darkness, 200 lux, 400 lux, 600 lux, 800 lux and 1000 lux on the mycelial biomass of the test fungus under laboratory condition in 250 ml conical flasks potato dextrose broth @ 100 ml each was dispensed, plugged and sterilized at 15 psi in autoclave for 15-20 minutes. For each treatment (light intensity) six replications were maintained in randomized block design. Conical flasks were inoculated with 5mm fungal disc, cut out from the growing margin of 15 days old culture and incubated at 26 ± 1ºC for 15 days. For maintaining different light intensities, one set comprising of six flasks was maintained in each situation *viz.* Darkness, 200 lux, 400 lux, 600 lux, 800 lux, and 1000 lux as measured by luxmeter. At the end of the experimental period, the mycelia mats were filtered from the conical flask with the help of whatman No.1 filter paper and the collected mycelia mats along with the filter paper put into hot air oven at 60º± 1ºC for 6 hours for complete drying and dry weight was recorded. The dry weight of all mycelia mat was obtained by subtracting the weight of the filter paper from the weight of the filter paper along with the mycelia mat.

This experiment was designed to ascertain the effect of different incubation temperatures such as 5º, 10º, 15º, 20º, 25º and 30º on the mycelia biomass of the species of test fungus under laboratory condition.

In order to determine the optimum temperature required for the growth of different oyster species, 20ml of the melted and sterilized PDA medium was poured into each petridish and cooled down to 40-45ºC for solidification under aseptic conditions. Five mm mycelia disc of the fungus was cut from the growing margin of 15 days old pure petriplate culture

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by means of sterilized cork borer and transferred carefully to the centre of each petriplate with the help of sterilized inoculating needle under aseptic condition. Four such petriplates were maintained for each species and all the petriplates were incubated in BOD incubators at 5, 10, 15, 20, 25 and 30ºC for 15 days. Linear growth by measuring the diameter in fixed directions were recorded in mm with the help of a transparent plastic scale. The colony was measured in crosswise directions and the average was calculated.

## RESULTS ND DISCUSSION

The linear growth of the ten test species on PDA medium on exposure to six different light intensities from darkness to 1000 lux at seven days of inoculation was recorded and presented in table1.

Analysis of data showed significant difference among the quanta of light in terms of mycelial growth of the fungus species. Significantly highest linear growth of all the test species was observed at 200 lux light intensity. The growth was observed to decline substantially as the light intensity was improved from 200-1000 lux. Growth performance was found to be moderate in darkness in all the species. Therefore, it was ascertained that low light intensity (near darkness or darkness) proved to be superior in facilitating vegetative growth of all the *Pleurotus* species. On the other hand, profuse light substantially reduced the vegetative growth of the oyster species evaluated. Further, the extent of growth was found to be highest in *P. citrinopileatus* (78.89 mm) and lowest in *P. eous* (63.92 mm) at 200 lux light intensity.

**Table1: Effect of light intensity on mycelial growth of 10 oyster species**

| Light | *P. eous* | *P. florida* | *P. sajor-caju* (CTMRT strain) | *P. citronopileatus* | *P. fossulatus* | *P. flabellatus* | *P. platypus* | *P. ostreatus* | *H. ulmarius* | *P. sajor-caju* (DMR strain) |
|---|---|---|---|---|---|---|---|---|---|---|
| Darkness | 56.17 | 48.24 | 57.77 | 53.55 | 48.38 | 52.38 | 52.56 | 49.41 | 54.52 | 50.63 |
| 200 lux | 63.92 | 76.94 | 77.87 | 78.89 | 70.27 | 68.49 | 68.38 | 72.72 | 77.45 | 70.70 |
| 400 lux | 39.90 | 47.79 | 53.31 | 42.52 | 37.83 | 45.71 | 48.69 | 38.35 | 51.66 | 42.97 |
| 600 lux | 33.64 | 37.59 | 40.06 | 40.37 | 34.06 | 42.67 | 39.80 | 34.71 | 42.72 | 39.15 |
| 800 lux | 29.94 | 33.74 | 31.96 | 33.71 | 29.95 | 41.51 | 31.43 | 31.96 | 36.21 | 36.83 |
| 1000 lux | 23.07 | 28.92 | 27.84 | 30.30 | 23.94 | 30.06 | 27.08 | 21.79 | 28.76 | 24.79 |
| **LSD (0.05)** | **0.48** | **0.69** | **1.04** | **1.00** | **0.55** | **0.63** | **0.49** | **0.73** | **0.98** | **2.49** |
| **CV (%)** | **0.78** | **1.00** | **1.44** | **1.42** | **0.90** | **0.89** | **0.72** | **1.17** | **1.33** | **3.74** |

**Table 2: Effect of incubation temperature onmycelial growth of 10 oyster species**

| Temperature (ºC) | *P. eous* | *P. florida* | *P. sajor-caju* (CTMRT strain) | *P. citronopileatus* | *P. fossulatus* | *P. flabellatus* | *P. platypus* | *P. ostreatus* | *H. ulmarius* | *P. sajor-caju* (DMR strain |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 38.88 | 0.00 | 0.00 | 29.64 | 19.98 | 0.00 | 19.77 | 14.79 | 0.00 | 0.00 |
| 15 | 49.25 | 35.10 | 34.70 | 28.82 | 35.62 | 28.33 | 29.19 | 28.78 | 21.75 | 35.47 |
| 20 | 49.01 | 35.16 | 41.00 | 27.75 | 35.80 | 35.96 | 35.85 | 28.69 | 28.47 | 42.22 |
| 25 | 35.65 | 70.31 | 73.30 | 32.01 | 64.74 | 57.03 | 63.60 | 36.05 | 63.86 | 70.25 |
| 30 | 28.25 | 63.39 | 66.12 | 21.64 | 57.11 | 56.77 | 56.62 | 49.82 | 42.97 | 60.99 |
| 35 | 0.00 | 0.00 | 58.55 | 1.31 | 33.82 | 8.57 | 0.00 | 5.88 | 0.00 | 18.84 |
| 40 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **LSD (0.05)** | **0.60** | **2.45** | **0.75** | **0.73** | **0.89** | **0.54** | **0.63** | **0.55** | **0.47** | **2.22** |
| **CV (%)** | **1.40** | **5.84** | **1.29** | **2.64** | **1.69** | **1.35** | **1.44** | **1.57** | **1.40** | **4.60** |

Being a sub-tropical mushroom, mycelial growth of all the *Pleurotus* spp. can take place between 20-30ºC. However, for fruiting different species have different temperature requirement. The growing temperature not only affects yields but also the quality of produce. In order to ascertain the optimum temperature requirement for both vegetative growth as well as yield, a trial was designed with temperature regimes from 10-40ºC and the growth obtained there from was recorded and is presented in table1.

Analysis of data indicated significant difference among the treatments in terms of colony diameter of the test species. The growth temperature of 15-20ºC was found superior for *P. eous*. However, *P. florida, P. sajor-caju* (CTMRT strain), *P. citrinopileatus, P. fossulatus, P. flabellatus* and *P. sajor-caju* (DMR strain) could exhibit good growth at 25ºC. *P. ostreatus* produced good growth at an incubation temperature of 30ºC. The extent of mycelial growth reduced drastically beyond the incubation

temperature of 30ºC and it was recorded that the growth was completely inhibited at temperature of 40ºC in all the test species at seven days of incubation, likewise, at low temperature (10ºC) growth declined drastically in all the test species (Table 2). The overall finding of the investigation indicated that a growing temperature of 15-30ºC was by and large suitable for all the test species of oyster mushroom. Temperature extremes (below or beyond the optimum range) were deleterious for vegetative growth.

Effect of different light intensity on the mycelial growth of 10 oyster species indicated the superiority of 200 lux light in producing the significantly highest linear mycelial growth of all the test species (63.92-78.89 cm). The growth was observed to decline substantially (21.79-51.66 cm) as the light intensity improved from 200-1000 lux. However, growth performance was found to be moderate (48.38-57.77 cm) in darkness. As such, mushrooms do not require light for the synthesis of food. This fact was substantiated by Zadrazil, 1973; Eger, 1978, Khan and Ali (1981) and Jatav *et al*., 2012.

The investigation on the influence of incubation temperature on the linear mycelial growth of oyster species showed that the growth temperature of 25ºC was superior could produce an ample biomass of eight of the ten species evaluated. The extent of mycelial growth reduced drastically beyond the incubation temperature of 30ºC and was completely inhibited at a temperature of 40ºC. On the other hand, at low temperature (10ºC) growth declined drastically in all the test species. The finding of this investigation was substantiated with the findings of Bano, 1967; Jandaik and Kapoor, 1976; Zadrazil, 1978; Bhatti, 1984; Mehta and Bhandal, 1988; Bhattacharjee and samajpati, 1989; Moorty, 1993 and Jandaik, 1997. The successful cultivation of oyster mushroom during the winter months in the coastal agro-ecological situation of the state justified the findings of this investigation.

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