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Studies on the effects of weather parameter correlation on the biological efficiency of *Pleurotus florida* and *Pleurotus sajor-caju* (CTMRT strain) in the East and South Eastern coastal plains of Odisha

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Pleurotus is one of the most extensively studied white rot fungi due to its exceptional ligninolytic properties. It is a mushroom that may be eaten, and weather factors such as temperature, relative humidity, light levels, etc.affect its survival. Different multiple regression analyses were run in the current study to determine the influence of independent variables on dependent variables. The investigation focused on two important oyster mushroom species *i.e.,Pleurotusflorida* another is *Pleurotussajor-caju* (CTMRT strain). The combined effects of mean daytime temperature and relative humidity on biological efficiency were calculated to be 98.20% and 94.70% respectively, at the 5% and 1% levels, and multiple correlation coefficients “r” were calculated to be 0.996 and 0.989 for above two species. A negative correlation was observed between mean maximum and mean minimum temperatures with biological efficiency and correlation coefficient “r” was recorded -0.804 (non-significant) and -0.984 (significant at 1% level) for *P.florida*,-0.936 and -0.887(significant both at 1% and 5% level) in *P.sajor-caju* (CTMRT strain).

Keywords: Biological efficiency, Correlation coefficient, Relative humidity, Temperature

INTRODUCTION

It has been documented that though over 200 species of mushrooms have long been utilized as functional foods worldwide (Kalac, 2013),only roughly 35 species have been commercially grown for profit. Proteins, minerals, and vitamins B, C, and D are among the many nutrients they contain in abundance (Panjikkaran and Mathew, 2013).Mushrooms are considered a delicacy meal because of their pleasing flavor and distinctive bite-ability.

On the global mushroom market, *Pleurotus* mushrooms come in second place. Because they produce a white mycelium and are typically grown on non-composted lignocellulosic substrates, *Pleurotus* spp. of the class Basidiomycetes are referred to as “white rot fungi” (Tsujiyama andUeno, 2013). Species of *Pleurotus* grow more quickly than other types of mushrooms. Its fruiting body is rarely attacked by diseases and pests, and it can be produced easily and inexpensively. It also has a high yield, extensive substrate usage, spore lessness, a wide range of temperature and chemical tolerance, as well as environmental bioremediation capabilities.It can develop at a variety of temperatures by using different types of lignocelluloses (Sánchez, 2010). Oyster mushrooms have become more widely grown due to its therapeutic qualities, ability to grow at a wide range of temperatures, and ability to withstand various agricultural residues. Additionally, it is highly adaptive to a range of agroclimatic situations on diverse agricultural waste types. Numerous variables, including temperature, humidity, and the sterility of the substrates- which can work alone or in combination with one another—are important for mushroom production.

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When it comes to oyster mushroom production in India, Odisha is the top state. Due to their superior flavor and soft, fleshy texture, one species *Pleurotusflorida* and another *Pleurotussajor-caju* are the dominant species in the state.Because of the region's mild winters, humid coastal agro-ecological conditions, plenty of labour and agricultural waste, oyster mushroom production is highly advantageous.It is cultivated in outdoor under tree shade in some districts. Nonetheless, in the remaining districts, it is primarily grown inside. Consequently, the goal of the current study is to investigate how meteorological conditions affect the biological efficiency of *Pleurotus spp*.

MATERIALS AND METHODS

Different studies were undertaken during the course of investigation by taking two species of oyster mushroom fungus, such *as P.florida* and *P. sajor-caju* (CTMRT strain). Fifteen day old pure mycelial cultures of the test fungi were used in various studies.

Rice straw that was hand-threshed, well-dried, and no older than a year was used. To prevent moisture, the straw bundles were kept in a protected environment. Using a chaff cutter, the straw was chopped to a size of 1.5 to 2.0 inches. One bag's worth of preparation required 1.5 kg of dry chopped straw.

To maintain proper humidity, aerial spraying of water was done and the sand put on the floor was also kept moist besides watering the substrate.All the experiments were conducted during the winter period(November to March) the best season for mushroom cultivation. Fully colonized bags were hung on bamboo sticks in the farm house for fruit body initiation.

A single bag (80cm x 40cm) needed three bundles of paddy straw which weighed approximately 1.5 kg. After being cut into 1.5–2.0 inch pieces with a chaff cutter, the straw was placed in gunny bags and left to soak for six hours in a solution containing 7.5 g of carbendazim and 125 ml of formalin per 90 litres of water.The soaked straw in gunny bag were removed spread over a concrete floor to drain remaining water and shed dried. The palm test ensured that the substrate's moisture level was 65% before spawning.

In the incubation area, spawned bags were stored on shelves to allow mycelia to colonize in the substrate. Bags were not opened and no ventilation was required throughout mycelia growth.Furthermore, there was no requirement of spraying moisture as it does not require to maintain a high relative humidity. The maximum, minimum temperature and RH of theincubation chamber were recorded on daily basis.

After the mycelium had completely colonized the substrate and developed a thick mycelia mat, the bags were taken out of the incubation room, stripped, and stacked in tiers on wooden shelves in the cropping room, leaving at least 15-20 cm separating each bed.

To encourage fruiting, the right conditions of temperature (20–30^{0}C), relative humidity (70–80%), and light (200 lux or 12 hrs per day) were maintained. To keep the substrate moist, water was sprayed into the bags twice a day in the morning and the afternoon.

After three to four days of opening of bags, mushroom primordia started to appear. Mushrooms were harvested in about three days after their appearance. Mushroom fruiting continued after harvesting of first flush at an interval of 7 days up to 3 flushes covering a crop period of 55-65 days.

The average biological efficiency (BE) of the harvests was calculated as per Peng *et al.* (2000).

$$\text{Biological efficiency} = \frac{\text{Weight of fresh mushrooms picked perbag}}{\text{Weight of each bag's dry substrate prior to inoculation}} \times 100$$

RESULTS AND DISCUSSION

To determine the effect of independent variables on dependent variables, multiple regression analysis was done (Tables 1, 2).

P. sajor-caju (CTMRT strain)

A negative correlation was established between both mean maximum and mean minimum temperatures with biological efficiency and the correlation coefficient 'r' was recorded at -0.936 and -0.887 (significant both at 1 % and 5 % level) in *P. sajor-caju* (CTMRT strain). The spawning period were not statistically different in respect of the influence of mean relative humidity on biological efficiency. The prediction equation was represented as follows:

$$y = 605.957 - 14.118X_1 - 3.176\ X_2 - 2.158\ X_3$$

where y = Biological efficiency; X_1 = Mean maximum temperature; X_2 = Mean minimum temperature X_3 = Mean relative humidity.

Overall, it was determined that the mean day temperature, relative humidity contributed 94.70% to biological efficiency. The multiple regression coefficient, or "r," was computed at 0.989 and was found to be significant at the 5% and 1% levels (Fig. 1).

P. florida

A negative correlation was established between both mean maximum and mean minimum temperatures with biological efficiency and the correlation coefficient 'r' was recorded at -0.804 (non-significant) and -0.984 (significant at 1 % level) *P. florida*. The spawning periods were not statistically different in respect of the influence of mean relative humidity on biological efficiency. The prediction equation was represented as follows:

$$y = 415.470 - 6.989X_1 - 1.\ 245\ X_2 - 1.548\ X_3$$

where, y = Biological efficiency X_1 = Mean maximum temperature; X_2 = Mean minimum temperature; X_3 = Mean relative humidity.

The multiple regression coefficient "r" was estimated at 0.996 and found to be significant atboth the 5% and 1% level (Fig. 2). The total contribution of mean day temperature and relative humidity on biological efficiency was determined to the tune of 98.20 %.

DISCUSSION

The productivity of *Pleurotus* species was shown to be significantly influenced by the maximum and minimum day temperatures as well as the relative humidity, according to a multiple regression analysis conducted to determine the impact of independent variables on dependent variables. The investigation revealed a negative association between biological efficiency and the mean maximum and mean minimum temperatures.

Table. 1: Influence of weather parameters on biological efficiency of *Pleurotussajor-caju*(CTMRT strain)

Period	Mean temperature (°C)		Mean RH (%)	Biological efficiency (%)	Prediction equation
	Maximum	Minimum			
1.11.2010-31.12.2010	29.08	17.95	73.00	92.08	$Y=605.957-14.118X_1+3.176X_2-2.158\ X_3$
1.01.2011-28.02.2011	30.81	15.76	64.44	82.50	$R^2 = 0.979$
1.03.2011-30.04.2011	36.12	23.35	66.33	31.60	Adj $R^2 = 0.947$
1.05.2011-30.06.2011	35.80	25.91	77.06	9.00	
1.07.2011-31.08.2011	32.41	25.32	87.88	42.98	
1.09.2011-31.10.2011	32.50	23.55	78.83	53.68	

Table 2: Influence of weather parameters on biological efficiency of *Pleurotusflorida*

Period	Mean temperature (°C)		Mean RH (%)	Biological efficiency (%)	Prediction equation
	Maximum	Minimum			
1.11.2010-31.12.2010	29.08	17.95	73.00	79.62	$Y=415.470-6.989X_1-1.245X_2-1.548\ X_3$
1.01.2011-28.02.2011	30.81	15.76	64.44	79.13	$R^2 = 0.993$
1.03.2011-30.04.2011	36.12	23.35	66.33	32.44	Adj $R^2 = 0.982$
1.05.2011-30.06.2011	35.80	25.91	77.06	14.46	
1.07.2011-31.08.2011	32.41	25.32	87.88	22.38	
1.09.2011-31.10.2011	32.50	23.55	78.83	32.70	

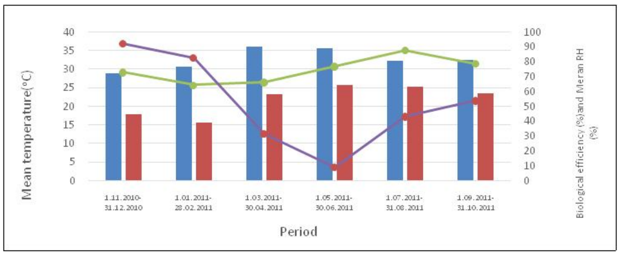

Fig.1: Effect of weather parameters on Biological Efficiency of *Pleurotussajorcaju*

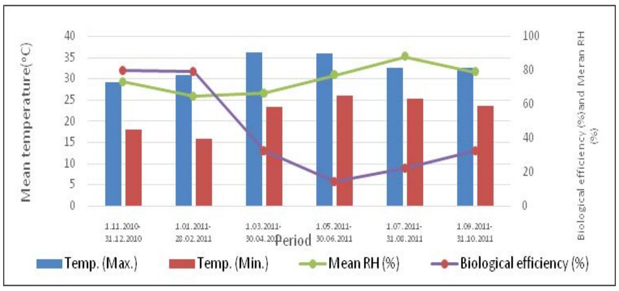

Fig. 2: Effect of weather parameters on Biological Efficiency of *Pleurotus florida*

However, across the six planting periods examined, there was no discernible variation in the mean relative humidity's impact on biological efficiency.The findings of this investigation wassubstantiated with the findings of Li *et al.* (2015), the appropriate humidity during the darkened spawn-running and mycelia stimulation should encompass a range between 60–75% and 85–97% respectively, in the environment, enabling a satisfactory growth of *Pleurotus* spp biological Kurtzman and Martinez-Carrera (2013)stated that all mushrooms, which require light, use a common regulatory pathway for basidioma development.

It was discovered that the mean daily temperature and relative humidity had a considerable overall impact on biological efficiency at both the 5% and 1% levels. When it comes to oyster mushroom production in an industrial setting, the effects of temperature and humidity on the species' productivity are significant. If at all possible, these crucial characteristics must be altered to get respectable yields from large-scale oyster mushroom cultivation; their effects on productivity are well-established. The commercial farmers will be encouraged by this to increase their productivity and output even more.Theimpact of relative humidity on biological efficiency across the six seeding dates examined.

CONCLUSION

The impact of the independent variables was determined using multiple regression analysisrevealed a negative association between mean maximum and dependent variablesmean lowest temperatures that both species' biological efficiency was assessed for.The combined impact of daily mean temperature and relative humidity on biological processes. It was discovered that efficiency was substantial at both the 1% and 5% levels.

DECLARATIONS

Conflict of Interest. Authors declare no conflict of interest.

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