

# PERFORMANCE OF STRAW MUSHROOM (*VOLVARIELLA VOLVACEA*) RAISED AS AN INTERCROP IN COCONUT PLANTATIONS OF COASTAL ODISHA

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## ABSTRACT

Paddy straw mushroom (*Volvariella volvacea*) is an edible mushroom of the tropics and sub-tropics. In India, Odisha is the leading state in terms of straw mushroom production (8129 tonnes/annum). It is cultivated outdoor as an intercrop in the coconut plantations in the coastal belt from the month of February to November. However, the yields are unstable and low (10 %). In a study to ascertain the seasonal productivity of straw mushroom under natural conditions, beds were raised at monthly intervals round the year in the coconut plantation of the Central Research Station of the University using appropriate protocol. Analysis of data indicated that the crop raised in the month of July gave significantly high yield of 1771 g/bed with a biological efficiency of 25.30 %. Appreciable higher yield levels obtained during the period from June to September (rainy season) were in the range of 1263-1771 g/bed in comparison to the summer crop (724-1097 g/bed). However, the yields realized from the months of December and January were substantially low (165.33 and 137 g/bed, respectively) with the biological efficiency of 2.36 and 1.95 %, respectively. Hence, it was concluded that the crop grown during the months of December and January are less productive and non-remunerative.

**Keywords:** *Volvariella volvacea*, coconut plantation, intercrop, productivity

Paddy straw mushroom (*Volvariella volvacea*) ranks sixth among the cultivated mushrooms of the world contributing to 3 % of total production [1]. It is a fast growing mushroom and under favourable growing conditions, the total crop cycle is completed within three weeks time. This mushroom can use wide range of cellulosic materials with a C:N ratio of 40-60. Presently, this mushroom is more popular in the coastal states like Odisha, Andhra Pradesh, Tamil Nadu, Kerala and West Bengal. In Odisha, paddy straw mushroom is largely cultivated as an intercrop in the coconut plantations of the coastal agro-ecological region of the state from the month of February to November. The hot and humid coastal climate experienced during rainy and summer months is favourable for raising paddy straw mushroom outdoor. However, conventional method of farming in tree shade leads to unstable and low yields (10 %) in the predominantly mushroom growing coastal belt of Odisha [2]. In this context, the present study was undertaken to ascertain the seasonal productivity of straw mushroom under natural climatic conditions and to correlate the yields with the prevalent weather conditions.

## MATERIALS AND METHODS

The experiment was conducted in Randomized Block Design with 12 treatments each with six replications in the coconut plantation of the Central Research Station, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha. Straw mushroom beds, each comprising of 7 kg dry paddy straw were raised after processing of good quality straw as per standard procedure. Bundles (1.5' length) were soaked in clean and cold water supplemented with one per cent calcium carbonate for six hours. Excess water was drained-off and beds of 1.5' x 1.5' x 1.5' (length x breadth x height) were prepared with 3 % each of spawn as well as wheat bran in three layers employing conventional method of cultivation. Beds were covered with transparent polythene sheets and appropriate aftercare was taken. After completion of the mycelial growth, beds were uncovered and adequate light and ventilation were ascertained in the growing areas to facilitate induction of fruit bodies. Appropriate substrate moisture was maintained to prevent desiccation of young buttons. The fruits of the first flush were harvested followed by providing the polythene cover once again. Then second flush was harvested. Observations were recorded on time taken (days) for emergence of pinheads, time taken for first harvest (days post-spawning), number of fruit bodies, average fruit body weight and total yield of mushrooms for three week cropping period

(kg/100 kg dry substrate).

The multiple regression analysis was performed to find out the impact of mean day temperature and relative humidity on mushroom productivity. The combined effect of mean day temperature and relative humidity on biological efficiency was represented by the prediction equation,  $y = - 50.587 + 0.748 X_1 + 0.581 X_2$  where

$y$  = Biological efficiency

$X_1$  = Mean day temperature

$X_2$  = Mean relative humidity

## RESULTS AND DISCUSSION

Data recorded on time taken (days) to pin head emergence, first harvest, number of sporophores, mean weight of fruit bodies (g) and total weight of fruit bodies (g) are presented in Table 1.

**Table 1.** Influence of time of spawning on yield of *V. volvacea*

Sl.No.	Month and year	Days to pin head emergence	Days to first harvest	Number of sporophores/bed	Mean wt. of sporophores (g)	Weight of sporophores/bed (g)	Biological efficiency (%)
1	January, 2011	16.83	21.50	9.83	13.66	136.66	1.95
2	February, 2011	14.00	19.50	41.33	17.16	724.00	10.34
3	March, 2011	8.50	14.66	60.66	18.16	1097.50	15.67
4	April, 2011	7.83	14.50	55.16	17.16	951.66	13.59
5	May, 2011	8.50	13.66	53.16	17.66	942.83	13.46
6	June, 2011	7.50	13.50	63.66	20.00	1263.00	18.04
7	July, 2011	8.33	14.66	84.16	21.50	1771.16	25.30
8	August, 2011	8.83	14.83	73.16	18.83	1372.33	19.60
9	September, 2011	9.00	14.50	65.00	20.83	1356.83	19.38
10	October, 2011	8.66	14.00	62.66	16.33	1019.16	14.55
11	November, 2011	11.66	16.50	50.33	15.16	766.66	10.95
12	December, 2011	18.00	22.16	14.50	13.50	165.33	2.36
	C.D. (0.05)	0.61	0.75	3.09	1.50	8.49	-
	C.V. (%)	5.00	4.04	5.06	7.44	0.76	

Analysis of data indicated that there was significant variation among the treatments in respect of all the parameters recorded. Significantly high yield of 1771 g/bed was obtained from the crop raised in the month of July. Superiority of the treatment was observed in terms of number of sporophores (84.16) and mean weight of sporophore (21.5 g) with a modest crop duration of 14.66 days. Further, it was observed that crop raised during the period from June to September (rainy season) recorded comparatively higher yields (1263–1771 g/bed) as compared to the yield levels obtained during the winter months of October to January (137-1019 g/bed). The yields realized from the summer crops raised during February to May (724-1097.5 g/bed) was better than the yields realized from winter crops. The lowest yield of 137 g/bed was recorded from the crop raised in the month of January. It appeared that the winter months are not favourable for raising paddy straw mushroom in outdoor conditions.

The multiple regression analysis performed to find out the impact of independent variables on dependant variables (Table 2) indicated a positive correlation between mean day temperature and biological efficiency wherein the correlation coefficient 'r' recorded at 0.633 was found to be significant at 5% level. Similarly the mean relative humidity influenced the biological efficiency positively and the correlation coefficient 'r' calculated at 0.785 was significant both at 5% and 1% level. The overall contribution of mean day temperature and relative humidity on biological efficiency was calculated to the tune of 72.50% and the correlation coefficient 'R' calculated at 0.88 was found to be significant at both 5% and 1% level.

**Table 2.** Correlation coefficient studies in *V. volvacea*

Sl.No.	Month and year	Mean day temperature (°C)	Mean relative humidity (%)	Biological efficiency (%)
1	January, 2011	21.39	63.10	1.95
2	February, 2011	26.83	63.25	10.34
3	March, 2011	30.07	71.12	15.67
4	April, 2011	32.88	67.90	13.59
5	May, 2011	31.90	76.00	13.46
6	June, 2011	31.03	80.62	18.04
7	July, 2011	26.20	84.60	25.30
8	August, 2011	29.88	82.12	19.60
9	September, 2011	29.25	82.87	19.38
10	October, 2011	27.69	80.80	14.55
11	November, 2011	26.36	75.12	10.95
12	December, 2011	20.67	70.87	2.36

Biological efficiency verses temperature correlation coefficient 'r' = 0.633\*

Biological efficiency verses relative humidity correlation coefficient 'r' = 0.785\*\*

Prediction equation  $y = - 50.587 + 0.748 X_1 + 0.581 X_2$

Coefficient of determination  $R^2 = 0.775$

$R^2$  (adjusted) = 0.725

Multiple regression coefficient 'R' = 0.880\*\*

Data indicated that the mean day temperature recorded during March to October was in the range of 26.2 to 32.88°C which was favourable for the fungus to grow and reproduce. The impact of climatic conditions on mushroom yield showed a positive correlation in between yield and mean day temperature and relative humidity. However, significantly high yield (1771.16 g/bed) was obtained in the month of July when the mean day temperature was 26.2°C with relative humidity of 84.6%. Earlier experiments recorded higher yields from *Volvariella volvacea* (15.9%) raised during the month of July in the temperature and relative humidity range of 25.1-33.1°C and 73-92 %, respectively [3]. Further, the development of deformities in *Volvariella volvacea* can be avoided by the maintenance of a constant growing temperature in the range of 22-28°C [4]. The optimum temperature and humidity for fruitification of *Volvariella volvacea* was found to be 28-32°C and 80%, respectively under conventional method of cultivation [5]. Findings of the present investigation was more or less in agreement with the findings of several workers[6, 7]. Moderate temperature (25-38°C) and high humidity (> 85 %) requirement of *Volvariella* spp. were once again proved in the above investigation.

## CONCLUSION

Rainy season (June to September) was found to be the appropriate one for raising *V. volvacea* crop having recorded comparatively higher yields (1263-1771 g/bed) than the summer and winter seasons. The summer crop raised during the

months of February-May recorded a modest yield of 724-1097.5 g/bed as compared to the yield levels (137-1019 g/bed) obtained during the winter months of October-January. The highest and lowest yields of 1771 and 137 g/bed, respectively were obtained from the crop raised during the month of July and January, respectively. It appeared that the winter months are not favourable for raising paddy straw mushroom in outdoor conditions.

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