

## CULTIVATION OF MUSHROOM *PLEUROTUS* SPP. ON VARIOUS SUBSTRATES

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Present study deals with artificial cultivation of mushroom *Pleurotus* spp., on different waste material substrates under controlled conditions in the semi-arid climate of Rajasthan. The main objective of the present investigation was to evaluate the best cellulosic waste substrate, which can be utilized for yielding maximum biomass of *Pleurotus* spp. For this purpose a systematic study was carried out on *Pleurotus* spp. using five different substrates viz. Wheat straw, Waste cotton, Banana leaves, Waste papers and Leaves wastes for its growth. Based upon the data collected round the cultivation period with the above said five substrates, it was found that the wheat straw proved to be the best substrate to obtain the maximum yield of *Pleurotus* spp.

**Keywords :** Banana leaves; Leaves waste; *Pleurotus* spp.; Waste cotton; Waste papers; Wheat straw.

### Introduction

The trends of consumption of cultivated mushrooms are rising. The mushroom *Pleurotus* has become the well recognized part of the world's mushroom industry. The increased demand particularly of this mushroom needs its high production. It has been considered as an excellent edible fungus which is very rich source of proteins, vitamins, fats and minerals<sup>1,2</sup>. *Pleurotus* spp. have desirable attributes like mycelium growth i.e., high ability for saprophytic colonization, simple and cheap cultivation techniques and easy post harvest storage, and above all these wide varieties of *Pleurotus* spp. are available for cultivation under different climatic conditions. Its cultivation under controlled conditions permits rich harvest during successive croppings, free from the effect of any change in natural climatic conditions. Besides this, its indoor artificial cultivation is possible on wide variety of cheap waste materials including agricultural, industrial and domestic wastes. Utilization of these cheaper wastes for cultivation of mushrooms is an extremely important ecofriendly approach in rural areas where an enormous quantity waste remains unused. With this view, in the present study *Pleurotus* spp. cultivation was carried out on five different waste material substrates viz. Wheat straw, Waste cotton, Banana leaves, Waste papers and Leaf litter, to evaluate the best substrate which can yield maximum biomass of the *Pleurotus* mushroom.

### Materials and Methods

To implement the objective of this study, cultures of

*Pleurotus* spp. were multiplied and maintained in test tubes on Malt Extract Agar Medium (2%) at  $28 \pm 1^\circ\text{C}$  temperature. For spawn production wheat seeds were used<sup>3</sup> and after complete treatment inoculated with the fungus on the malt extract media for growing cultures. After complete spawn production these were transferred into bags by successive layering of substrates and spawn. In this way 5 cultivation bags were prepared separately by utilizing above said substrates with spawn at the rate of 4%<sup>4</sup>.

In each cultivation bag 4 layers of substrate with 3 layers of spawn were filled to make a complete bag. To these bags Bavastin and Nuvan fumigants were also added, which protected the cultures from contamination by other microbes.

These bags were then transferred to well ventilated and fumigated (with 2% formaldehyde spraying) culture room with optimum conditions of temperature  $25-30^\circ\text{C}$  & moisture 70-85%<sup>5</sup>.

After complete spawn-run bags were opened and inverted and kept open in air for further growth. These were irrigated with water at regular intervals for proper growth. The cultures were allowed to grow for the time period of 45 days for the development and maturation of fruiting bodies.

Mushroom crop was harvested from each cultivation bag when the fruiting bodies had attained the size of 5-8 cm in diameter. The whole mushroom biomass from each bag dried in indirect sunlight for 2 days in an inverted position

**Table 1.** Comparative observation of *Pleurotus* Spp. Grown on five different substrates.

S.No.	Substrate	Wet Weight of Substrate (Kg)	Spawn Run (Days)	Fruit Body Primordia Formation (Days)	Number of Harvest	Total Yield (gms)
1.	Wheat Straw	6	12	15	3	700
2.	Waste Cotton	6	12	16	3	650
3.	Banana Leaves	6	15	18	2	500
4.	Waste Papers	6	15	20	2	250
5.	Leaves Waste	6	18	28	1	20

to remove water from gills and weighed for the estimation of yield.

#### Results and Discussion

Data presented in Table-1, revealed that amongst the 5 substrate tested, wheat straw was found to be the most suitable substrate for the growth of *Pleurotus* mushroom. There was variation in the duration of spawn run and fruiting body primordial formation on different substrates. Thus, number of harvests of mushroom varied during the total growing period of crop (45 days).

The wheat straw substrate was proved to be the most favourable substrate for the growth of *Pleurotus* mushroom. Maximum yield i.e. 700 gms of the mushroom was recorded by three harvests with 12 days for complete spawn run, 15 days for fruiting body primordial formation. As far as yield, duration of complete, wheat straw found to be the superior one than the other substrates for the growth of *Pleurotus* spp. These results are approved by the finding of Zervakis *et al.*<sup>5</sup>, Zhang *et al.*<sup>6</sup> and Salmons *et al.*<sup>7</sup>

There are some stray reports on *Pleurotus* spp. cultivation on cotton peel<sup>8</sup>, Cotton residue<sup>3</sup> and cotton seed hull<sup>9</sup>, but in the present study waste cotton substrate also worked well. Results (Table 1) showed that on this substrate also with 12 days of complete spawn run and 16 days for fruiting body primordial formation, 650 gms of mushroom yield was obtained by 3 harvests.

In the case of banana leaves 500 gms of mushroom yield was obtained by 2 harvests. It took more time i.e. 15 days for complete spawn run and 18 days for fruiting body primordial appearance. Thus banana leaves also acted as a good substrate material as far as yield is concerned. These results are in accordance with the findings of Reddy *et al.*<sup>10</sup> and Obodai *et al.*<sup>11</sup>. In their studies IR spectra revealed the presence of cellulose,

xyloxy, lignin and fibres in the banana leaves. Presence of these constituents is positively correlated with the yield of mushroom<sup>11</sup>, and these may be responsible for the substrate quality of banana leaves.

Observations on waste paper substrate revealed 250 gms of mushroom yield by harvests, with 15 days for spawn run and 20 days for fruiting body primordial formation (Table 1). However, waste paper as such was not used before this attempt, but waste paper supplemented with chicken manure and rice husk was experimented by Baysal *et al.*<sup>12</sup>, in which waste paper supplemented with rice husk had given good results. 350.2 gms of yield with 15 days for spawn run and 21 days for fruiting bodies formation was obtained by them. These findings are in close conformity with the present findings. Presence of rice husk may be the cause for getting high yield.

Amongst all the tested substrates, leaves waste was found to be poor productive. Only 20 gms of yield in single harvest and it also took more time (18 days) for spawn run (28 days) for fruiting body appearance. Poor yield of *Pleurotus* by utilizing this substrate was also observed by Rodriguez *et al.*<sup>13</sup>.

On the basis of present investigation it can be concluded that for *Pleurotus* mushroom cultivation waste cotton and Banana leaves substrates can be utilized but wheat straw proved to be the best and highly productive substrate.

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