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## Effect of different substrates on yield potential of Oyster mushroom (*Pleurotussajor-caju*)

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### Abstract

A study was conducted to examine the effect of different types of substrate (growing medium) on yield of mushroom (*Pleurotussajor-caju*) for production using four types of substrates like Wheat straw (WS), Paddy straw (PS) Mustered siliqua (MS) and Dried sugarcane leaves (DS), these substrate are generally agro waste leading environmental pollution after being. Various parameters are observed such as cropping period (days), pinhead initiation (days), number of sporophores and yield. The experiments were conducted in completely randomized design with three replicates. Results revealed that wheat straw + mustered siliqua (1:1) ratio produced better results in comparison to other treatments for minimum days of cropping period (71.5 day), pinhead initiation (19 day), highest number of sporophores/kg substrate (25.2) and increased yield (54.60 kg/q substrate).

**Keywords:** yield potential, Oyster mushroom, *Pleurotussajor-caju*

### Introduction

The mushroom is recognized as fleshy macro-fungi, a group of achlorophyllous organisms. These are sometimes tough and umbrella like sporophore (fruiting body) with spores, naturally grown in fields, forests, on manure heaps, water channels and hilly areas, mostly during and just after rains. Since earliest time, the mushrooms have been treated as special kinds of food. *Pleurotus* with different species constitute a cost effective means of both supplementing the nutrition to human kind through the production of edible mushrooms and alleviating the suffering caused by certain kinds of illnesses through the use of medicinal mushrooms. They are considered as one of the four major edible mushrooms cultivated in different countries for human consumption. The chemical composition of the fresh fruiting bodies of oyster mushroom, *Pleurotus* indicates a large quantity of moisture (90.8%), whereas fresh as well as dry oyster mushrooms are rich in proteins (30.4%), fat (2.2%), carbohydrates (57.6%), fiber (8.7%) and ash (9.8%) with 345 K (cal) energy value on 100 g dry weight basis; while vitamins such as thiamin (4.8 mg), riboflavin (4.7 mg) and niacin (108.7 mg), minerals like calcium (98 mg), phosphorus (476 mg), ferrous (8.5 mg) and sodium (61 mg) on 100 g dry weight basis, are also found present (Pandey & Ghosh, 1996)<sup>[6]</sup>. Rambelli & Menini (1985)<sup>[7]</sup> reported that this mushroom is reputed to be antitumoural because of its chemical composition. Growing medium of the mushroom is generally known as substrate. An addition of organic and inorganic supplements to the substrate from outside to improve the yield of mushroom have therefore been recommended by many workers (Jain and Vyas, 2002 and Chaubey *et al.*, 2010)<sup>[8, 9]</sup>. Cultivation of oyster mushroom on Soybean straw and other conventional substrates is cheaper result the reduction in production cost of mushroom and utilizing agriculture waste would certain help to reduce the environmental problems particularly accumulation of filthcarbon sequesters, nutrients, metal sequestration and ultimately mushroom cultivation help us to achieve bioremediation (Dehariya *et al.*, 2010)<sup>[5]</sup>. This study therefore aimed at investigating the effect of local substrates in the cultivation of Oyster mushroom in Uttar Pradesh. This may subsequently help in increasing living standards, environmental cleaning, providing quality protein and self-employment to rural youths in the country.

### Materials and methods

The experiments were conducted during 2012-2013 in Mushroom Laboratory, Department Plant of Pathology, S. V. P. University of Agriculture and Technology, Meerut, U.P, India, which is situated on the Western side of the Delhi-Dehradun high way (NH-58) at a distance of 10.0 km away in the north of Meerut city. On the basis of meteorological observation Meerut is situated between 29°01'N latitude and 77°45'E longitude at an altitude of 237 meters above the mean sea-level.

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The culture oyster mushroom (*Pleurotussajor-caju*) was isolated from sporophore of the oyster mushroom in mushroom lab of plant pathology department in SVPUA&T Meerut-250110 India. The mushroom strain was pre-cultured on potato dextrose agar (PDA) and incubated at 25 °C. These were maintained as pure cultures in a refrigerator at 8 ± 2 °C in order to preserve the mushroom in its active state.

### Mushroom seed (spawn) production

A modified method outlined was used to prepare the spawn, where by 1 kg of wheat grain was soaked overnight in 1.5 litres of water and the excess water was thereafter drained from the grains. A quantity of 1 kg of the soaked grains was mixed with 12 g of the gypsum and 3 g CaCO<sub>3</sub>. The mixture was packed halfway into 250 ml bottles. Gypsum prevents the sticking of wheat grains together and calcium carbonate maintains the pH 5.5 -7.5. The grains were filled up to (100 mm) in the bottle in three replicates. The bottles were plugged with non-absorbent cotton and covered with butter paper. These bottles were then sterilized at 121°C (15 lbs pressure) for 2 hours on two consecutive days. Sterilized bottles were taken out from the autoclave, while still hot and were shaken to avoid clumping of grains. Sterilized bottles were inoculated by 9mm disc of previously grown pure cultures of *Pleurotussajor-caju* strain using a flamed and cooled scalpel in a laminar flow hood. The spawn bottles were incubated without shaking at 24±1°C in B.O.D incubator for two weeks until the mycelium had fully colonised the grain.

### Mushroom Production

This experiment was used different substrate with different ratioviz. Wheat straw (WS) + Mustard siliqua (1:1), Wheat straw (WS) + Dried sugarcane leaves (1:1), Wheat straw (WS) + Paddy straw (1:1), Mustard siliqua, Dry sugarcane leaves, Paddy straw and Wheat straw. It was soaked (10kg substrate/100liter water) in a tank with solution of Carbendazim (8gm/100liter water) + Formalin (120ml/100liter water) for 18 hr (tank should be covered with polythene sheet to prevent the evaporation of formalin (Vijay and Sohi1987). Thereafter, straw was taken out from the solution and kept for 2-3 hours to drain out the excess water. Spawning was done under aseptic condition. Oyster mushroom spawn mixed with Wheat straw (substrate) @ 4 percent per kg on dry weight basis and 3kg substrate (containing 60-65% moisture) filled in each polythene bags (22×12") in three replications and made 8-10 holes in each bags for aeration. After spawning bags were kept in the spawn running room under dark condition. In spawn running room temperature (22° to 26°C) and relative humidity (80 to 90 percent) was maintained during spawn run. Humidity was maintained by water spraying three times a day. After the compilations of spawn run in the straw it becomes a compact mass which also sticks to the polythene bags and then polythene were cut and opened for Sporophore formation and it kept in cropping room. At the time of sporophores formation the windows were kept open for 1 – 2 hour to provide fresh air, to release CO<sub>2</sub> and to maintain the relative humidity at 80-90 per cent inside the croproom. Spawn run period given was about 20 ± 2 days.

After spawn run, compact stack of substrates were kept in crop room for the sporophores production. The pin heads were started to appear in 6 ± 1 days. The sporophores were harvested one week days after pinhead initiation. These were harvested by one gentle twisting at the base, taking care that the broken stumps were not left there to avoid rotting in the

remaining flushes of running crop. 3-4 flushes were taken after that very few fruiting bodies appear. After the first two flushes, the spawn run blocks were over turned to allow the lower surface and the base to produce fruiting bodies. A total time for cropping up to 3rd flush is about 65 ± 2 days. Watering of the crop is quite important which must be done with a mist sprayer. The water spraying should be done by sprinkler on the blocks after the fruit body start coming up but the floor and walls of the mushroom crop room must be kept moist to maintain requisite humidity (80-90 per cent). Adequate ventilation in the crop room was provided by opening the doors and windows at night for a short time. The fruiting bodies must be protected from direct sunlight but some diffused light (2500-3000 Lux) should be allowed to induce fruiting body formation. The crop room floor and wall were sprayed with 0.1 per cent Malathion or Sevin and/or light trap to protect it from insect infestation. To prevent the fungal infection, two sprays of Carbendazim 0.02 per cent were given.

The Sporophores of *P. sajor-caju* was harvested after the maturity. Before the harvesting sporophores were irrigated for keep it fresh. The yield obtained in 7 weeks harvesting period were compared with each other. After first harvesting bags were scraped and remain without irrigation for three days and then again irrigated after pinhead initiation. Same process was followed after second harvesting. Adequate ventilation in the crop room was provided by opening the doors and windows at night for a short duration during cropping.

### Statistical analysis

The Complete randomized design (CRD) was applied and the data thus obtained were analyzed statistically. Analysis of variance (ANOVA) technique and critical difference (CD) was calculated at five percent level of significance for comparison with other treatment (Steel *et al.*, 1997)<sup>[10]</sup>.

### Results and discussion

The results of the present study are summarized and inlet in the Table-1 shows yield performance of *Pleurotussajor-caju*. The experiments results indicated that, maximum average yield (54.60 kg/q substrate) was observed in wheat straw + mustered siliqua (1:1) which was significantly higher than all other treatments while minimum average yield was observed at control (42.75 kg/q substrate) which was significantly lower than all other treatments.

The highest number of sporophores/kg substrate (25.20) was observed from wheat straw + mustered siliqua (1:1) and lowest days for pin head initiation (19) which was significantly all other treatments. The minimum number of sporophores/kg substrate (17.50) and highest days for pin head initiation (23) was observed from control which was significantly all other treatments.

The maximum days for cropping period (83.5 days) were observed at control i.e. wheat straw alone which was significantly. The minimum days for cropping period (71.5 days) were observed at wheat straw + mustered siliqua (1:1) and similar with wheat straw + dried sugarcane leaves (1:1) which was significantly lower than all other treatments.

Cultivation of oyster mushroom on Soybean straw and other conventional substrates is cheaper result the reduction in production cost of mushroom and utilizing agriculture waste would certain help to reduce the environmental problems particularly accumulation of filth carbon sequesters, nutrients, metal sequestration and ultimately mushroom cultivation help us to achieve bioremediation (Dehari *et al.*, 2010)<sup>[5]</sup>.

Sharma and Jandaik (1981)<sup>[9]</sup> reported that size and weight of fruiting body was much higher in paddy straw as compared to wheat straw. Chandrashekhar *et al* (2001)<sup>[2]</sup> reported that sugarcane bagasse is also good substrate for *P. sajor-caju*

with paddy straw. Wheat straw + sugarcane leaves and paddy straw + sugarcane leaves substrate produced significantly higher yield and number of sporophore as compared to wheat straw (Baliyan, 2008)<sup>[1]</sup>.

Table 1

S.N.	Treatment	Cropping period (Days)			Pin Head Initiation (Days)			Number of Sporophores/Kg Substrate			Yield Kg/Q Substrate		
		2012	2013	Av.	2012	2013	Av.	2012	2013	Av.	2012	2013	Av.
T1	WS + MS (1:1)	72	71	71.5	19	19	19.0	23.60	26.80	25.2	53.20	56.00	54.6
T2	WS + DS (1:1)	72	71	71.5	19	19	19.0	23.30	23.50	23.4	51.00	52.00	51.5
T3	WS + PS (1:1)	74	73	73.5	21	21	21.0	22.00	23.00	22.5	51.00	51.00	51.0
T4	MS	74	73	73.5	22	21	21.5	22.00	22.00	22.0	50.00	50.00	50.0
T5	DS	81	79	80.0	22	21	21.5	21.00	21.00	21.0	46.30	47.00	46.65
T6	PS	81	79	80.0	24	23	23.5	18.00	19.00	18.5	44.60	44.50	44.55
T7	WS (Control)	84	83	83.5	24	23	23.5	17.00	18.00	17.5	43.00	42.50	42.75
	CD @ 5%	N-S	N-S		N-S	N-S		2.20	2.26		3.26	3.42	

WS = Wheat straw, PS = Paddy straw, MS = Mustard siliqua and DS = Dried sugarcane leaves

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