

Original Research Article

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Effect of Different Agricultural Wastes on the Production of Oyster Mushroom (*Pleurotus florida*)

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ABSTRACT

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The various agricultural wastes as treatment, selected for the cultivation of oyster mushroom (*Pleurotus florida*) were paddy straw (T₁), wheat straw (T₂), maize cobb (T₃), sugarcane bagasse (T₄), Tulsi stalk (T₅) and each of 4 kg and replicated for 3 times. The experimental design used was single factor Completely Randomized Design (CRD). The highest yield (1380 gm) with stipe length (2.60 cm) and pileus diameter (7.90 cm) was obtained from the wheat straw followed by other substrates. The spawn run duration (11.20 days) was lower in wheat straw and highest time required for spawn run in tulsi stalk (19.80 days), while pinhead formation (21.40 days) was lower in case of wheat straw and maximum time required for pinhead formation in tulsi stalk (28.70 days). The analysis showed that mushroom production was best in wheat straw.

Introduction

Oyster mushroom belongs to phylum Basidiomycota, order Agaricales and family Pleurotaceae (Randive, 2012). It's the second largest cultivated mushroom after button mushroom. The oyster mushroom can be cultivated on the wide range of temperature 15-30°C and relative humidity between 60-75%. It can also cultivate in summer season in controlled environment. The growing season which is most suitable is March/April to Sept/October and in lower region Sept/October to March/April Dubey *et al.*, (2019). It possesses number of therapeutic properties like anti-inflammatory, immunostimulatory and anticancer activity etc.

The oyster mushrooms are rich in proteins (30.4%), fat (2.3%), carbohydrates (57.6%), fiber (8.7%), ash (9.8%), Iqbal *et al.*, (2016) and some vitamins such as thiamin (4.8mg), riboflavin (4.7mg) and niacin (108.7mg), minerals like calcium (98mg), phosphorus (476mg), ferrous (8.5mg) and sodium (61mg) with 345 K (cal.) energy value on 100 g dry weight basis Bhatti *et al.*, (2007). The mushroom is an excellent food source to alleviate malnutrition in developing countries due to their flavor, texture, nutritional value and high productivity per unit area. Gunde and Cinerman, reported that oyster mushroom at maturity has a cap spanning diameter of 5 to 25 cm. The fruiting body of oyster mushroom differs with respect to stipe length

and girth, and pileus width when grown on different agricultural wastes such as paddy straw, wheat straw, maize stalk, maize cobb, sugarcane bagasse, sawdust, spent grain etc. (Badshah *et al.*, 1992). The mushroom yield is depending on chemical and biological composition of substrates Tsegaye and Tefera (2017). The nutritional quality and minerals contents not totally depend upon mushroom species but also depend upon used substrates Hoa *et al.*, (2015). The various agricultural wastes which contain cellulose, hemicellulose and lignin can be used for cultivation of oyster mushroom like rice and wheat straw, banana leaves, cottonseed hulls, corncob, sugarcane bagasse, sawdust, waste paper, leaves Neupane *et al.*, (2018). The nutrition requirement is depending upon species of mushroom and used substrates, oyster mushroom require low amount of nitrogen and more amount of carbon. In this study we are going to observe growth of same species mushroom on different agricultural waste material, spawn run, average number of fruiting body and yield of same species on different agricultural waste material and physical characteristics of oyster mushroom.

Materials and Methods

Substrates collection

The different agricultural substrates are collected from different source paddy straw collected from College of Veterinary, wheat straw available in mushroom laboratory, maize cobb and sugarcane bagasse from local village Shivnathpur, tulsii stalk from research centre of Medicinal Aromatic and Plantation, A.N.D.U.A. & T. Kumarganj, Ayodhya.

Substrates preparation and bag filling

All substrates are chopped into small pieces (1-3 cm long) and soaked in clean tap water these practices applied 3 to 4 times for clean

washed then dried in shady place for 24 hours. Next day substrates are soaked in solution containing 150 ml of formalin (40%) and 8g of Bavistin per 90 litres of water for overnight. Next day substrates are placed on the large sieve for draining the excess water for 6 to 8 hours then placed in a shady place for bringing an optimum moisture level in substrates. When optimum moisture level obtains it can use for filling the bag. For inoculation of spawn takes 16''× 24'' were taken and its one side was tied with a rope. It was done in such a way that it gets its circular shape after filling it with substrates. The bags were filled with substrates making 3 layers, each layer weighing 1.2 kg making total weight of 4kg.

Spawning

The spawning was carried out aseptically with grain spawn. The spawn was spread in every layer of straw and pressed slightly to make bag compact. The last layer was broadcasted with spawn and covered with thin layer of substrate. After inoculating the bag with spawn, mouth of the bag was secured tightly with thread. Small holes were made for aeration on the lateral sides and top of the bag.

Incubation

After spawning the bag was placed in dark and well-ventilated room until the mycelium not reached into bottom of substrates. The bags are placed on racks at different height for avoiding direct insect-pest attack. After 11-20 days, spawn run was observed and whole bags are covered with white mycelium. Then the outer covering of plastic bags was cut and removed gently and bags were arranged on iron racks about 25 cm apart with gap 60 cm between two shelves. Maintain moisture level by regular watering was done thrice a day at morning, noon and evening.

Primordial growth of mushroom was seen within about one week after cutting of plastics. During this stage room was exposed to the diffused light. The Humidifier was used for to maintain the humidity condition of the mushroom house as it was hot weather.

Harvesting

Harvesting was done when the cap attained the maximum diameter. Picking was done by twisting gently so that it is pulled out without leaving any stalk and also the nearby fruiting bodies are not disturbed. The base of the stipe deep within the straw was removed by cutting with sharp knife. The right stage for picking was judged by observing the shape and size of the fruit body. Mushroom was weighed after each harvest. In average, three harvesting was done.

Results and Discussion

The different substrates yield and attributing characteristics were measured and compared. The various substrates which were used in this study showed variation in spawn run and duration of pinhead formation.

Spawn run and Pinhead formation

Among the tested substrate, wheat straw and paddy straw required lesser time for spawn run (11.20 days & 15.35 days respectively) followed by sugarcane bagasse and the longer duration was required for tulsii stalk (19.80 days).

The similarly, pinhead formation was also found to be faster in wheat straw (21.40 days) and paddy straw (24.60 days) followed by sugarcane bagasse (23.65 days), maize cob (26.90 days) and tulsii stalk (28.70 days) table 1. Deshmukh and Deshmukh (2016) reported that *Pleurotus florida* required 13 to 19 days for complete spawn run on different

substrates. The days required for pinhead formation ranges from 21.40 days (wheat straw 100%) to 28.70 days in (tulsii stalk 100%) earlier reported by Dehariya and Vyas (2013) (32.00 days), Iqbal *et al.*, (2016) reported that time duration required for pinhead formation varies between 17 to 23 days, and in combination with three different ratio's, ranges from 26.89 days (paddy straw + sugarcane bagasse 50:50) to 33.67 days in (wheat straw + tulsii stalk 25:75).

Stipe length and pilus diameter

The stipe length and pileus diameter of oyster mushroom was measured in an average up to three harvests and observed the significant difference among the substrate. The highest stipe length was obtained in paddy straw 2.90 cm followed by wheat straw, maize cob, sugarcane bagasse and tulsii stalk were 2.60 cm, 2.50 cm, 2.40 cm and (2.10 cm) respectively.

Likewise, pileus diameter was also found highest from paddy straw i.e. 8.10 cm followed by wheat straw, sugarcane bagasse, maize cob and tulsii stalk which were 7.90 cm, 6.80 cm, 6.80 cm, and 5.80 cm respectively under similar environment and cultural practices among other substrates.

Average number and average weight of fruiting body

Among all substrates the highest number of fruiting body was obtained from the wheat straw (24) followed by paddy straw (22) & lowest in tulsii stalk (13).

Similarly, the maximum weight of fruiting body recorded in wheat straw (5g) followed by sugarcane bagasse, paddy straw, tulsii stalk and maize cob i.e. 4.95g, 4.90g, 4.86g and 4.80g respectively.

Table.1 Evaluation of substrates on growth parameters and yield of *Pleurotus* spp. strain *Pf-2*

Treatments	Spawn run (days)	Pinhead formation (days)	Average Weight of the Fruiting body (g)	Average number of the Fruiting body	Shape	Size		Total harvest Yield (gm/kg substrates)
						Pileus diameter (cm)	Stipe Length (cm)	
Wheat Straw	11.20	21.40	5.00	24.00	Funnel-shaped	7.90	2.60	1380.00
Paddy Straw	15.35	24.60	4.90	22.00	Funnel-shaped	8.10	2.90	1240.00
Sugarcane Bagasse	16.20	23.65	4.95	18.00	Funnel-shaped	6.80	2.40	1140.00
Tulsi Stalk	19.80	28.70	4.86	13.00	Funnel-shaped	6.90	2.50	970.00
Maize Cob	18.50	26.90	4.80	19.00	Funnel-shaped	6.80	2.50	940.00
CD (0.05)	1.993	2.095	1.050	2.180		1.019	0.211	137.987
CV %	6.673	4.563	15.179	6.163		7.578	13.132	6.603
SEm±	0.625	0.656	0.430	0.683		0.319	0.196	43.23
SE(d)	0.883	0.928	0.608	0.966		0.452	0.277	61.139

Total yield

The highest yield was recorded in wheat straw (1380 g/kg substrates) followed by paddy straw (1240 g/kg substrates) and sugarcane bagasse (1140 g/kg substrates). The lowest yield was recorded in tulsii stalk (940 g/kg substrates). The similar results found that conducted by Vijaykumar *et al.*, (2013) in wheat straw (1463gm) and in sugarcane bagasse similar result found by Anuradha and Sharma, (2007).

This study was conducted by growing *Pleurotus florida* on five different substrates *i.e.* wheat straw, paddy straw, sugarcane bagasse, maize cob and tulsii stalk. Among all the treatments, wheat straw was found most suitable for *Pleurotus florida* cultivation in terms of yield (1380 g) than other substrates wheat straw, paddy straw, sugarcane bagasse, maize cob and tulsii stalk. Though the lower yield of *Pleurotus florida* was obtained on tulsii stalk but their successful cultivation on all the agricultural wastes proved an economical and most viable venture.

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