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Cultivation and yield performance of oyster mushroom (*Pleurotus florida*) on wheat straw

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Abstract
The present study was carried out to investigate the yield performance of Oyster Mushroom *(Pleurotus florida*) on Wheat Straw in year 2017 at Narla in Uttarkashi district. Analysis of results revealed the completion of spawn running (in days), appearance of pinhead (in days), maturation of pinheads (in days), flush wise yield (g), total yield (g) and biological efficiency (in percent). The appearance of Spawn running takes 20 days whereas pinhead and their maturity took 25 days and 28 days, respectively on wheat straw. The yield obtained flush wise was 648g, 420g and 259g for first, second and third flush, respectively. Total yield obtained was 1327g and biological efficiency as 132.7 per cent.

Keywords: spawn, yield, culture media, wheat straw and *Pleurotus florida*

Introduction
Oyster mushroom enjoys worldwide distribution from temperate to tropical regions growing saprophytically at a temperature range of 12-32°C (Zadrazil, 1978) [22]. Mushrooms are an excellent source of minerals and protein and also known as the vegetarian's meat (Khan, 1981). Oyster mushroom fresh fruiting bodies indicates a high quantity of moisture (90.8%), and nutritionally dry as well as fresh oyster mushrooms are rich in carbohydrate (57.6%), protein (30.4%), fiber (8.7%), fat (2.2%) and ash (9.8%) with 345 kilocalories energy value per 100g dry weight. The proteins content in mushroom are considered to be intermediate between vegetables and animals (Kurtzman, 1975) [11]. According to Furlani and Godoy, mushrooms are considered as food with high nutritional value with delicious taste. The *P. florida* is also able to produce metabolites of medicinal and pharmacological interest, such as antimicrobials, immunostimulants, antioxidants and antitumourals (Elmastas *et al*., 2007; Moradali *et al*., 2007) [6, 12]. Cultivation of Mushroom is eco-friendly and profitable agribusiness but labour-intensive (Chandha and Sharma, 1995) [4]. The substrate source, spawn quality, strain and compost affect the performance and growth of oyster mushroom *P. florida* (Royse *et al.* 2004) [17]. Moreover, its commercial production is easy and least expensive (Banik and Nandi, 2007; Pant *et al*, 2006) [3, 13]. Various substrates such as wheat straw, rice straw and sawdust are used for oyster mushroom cultivation (Quimio *et al.*, 1990) [14]. The cultivation is easy under both temperate and tropical climatic conditions and they are cultivated and harvested throughout the year (Amin *et al.*, 2007) [2]. The cultivation of mushroom serves as the most efficient and economically viable bio technique for the conversion of lingo-cellulose waste materials to high quality food and this will naturally open up new job opportunities especially in rural areas (Hussian, 2001) [8]. Therefore, the proposed study was conducted to find out the response of oyster mushroom yield on wheat straw.

Materials and Methods
The experiment was conducted in mushroom house at Narli, Uttarkashi in January 2017 and following steps were followed.

1. Preparation of culture media
Initially, pure culture of oyster mushroom was maintained on potato dextrose agar (PDA) and malt extract agar (MEA) slant. PDA (39g) was prepared by mixing potato extract (4g), Dextrose (20g) and Agar (15g). Another media, MEA (50g) was prepared by mixing malt extract (30g), mycological peptone (5g) and agar (15g). Both the media's were mixed in 1 liter distilled water and heated till agar dissolve.

Sterilization was done by autoclaving it at 121°C for 15 min. Pouring of media was done on Laminar Air Flow into Petri dishes having 9cm diameter. Each petridish was inoculated with the oyster mushroom *P. florida* culture by using spatula and was incubated at 25 ± 3°C. Mycelium growth was measured in terms of diameter on culture plate using ruler.

2. Spawn production

Spawn production is a highly technical operation and is generally done in laboratory. Spawn was prepared usually on wheat grains. The grains were washed and soaked in water overnight but, to prevent fermentation, water was changed often. After presoaking treatment, grains were boiled till they become soft, but remain firmed. Water was drained and spread on a cheese cloth and were mixed with Calcium carbonate (2%). Later, these grains were filled in bottle jars having 500g capacity and were filled upto three-fourths (3/4) of their capacity. Then these grains were sterilized by autoclaving at 121°C temperature and 15 pas (Pascal) pressure for 30 min. Then prepared pure culture or grain spawn inoculums was carefully inoculated in total aseptic conditions. After the inoculation, the bottles were incubated at 25± C temperature for few days. It was observed that wheat spawn was fully covered by mushroom mycelia and this process normally takes 14 to 20 days, after inoculation of pure mushroom culture. It may vary with spawn composition like on Baggase spawn 14 days, on Sorghum spawn 16 days, on wheat spawn 18 days and on millet spawn 20 days were taken to show mycelium growth. The prepared spawn should be used as soon as possible, otherwise it become compact with time and make spawning difficult.

3. Preparation of Composting

To prepare the compost, dry straws of wheat were boiled at 100^0-110^0C for about an hour, then these straws were taken out and kept in wooden basket for draining out the water part. Moisture level is judged morphologically by hand feeling method and then these straws were spread over the clean polythene sheet to allow them to cool. After cooling, 100 g spawn and little quantity of *Besan*, as food supplement was sprayed over about 2.5 to 3 Kg of straw and was mix properly. After that the mixture was filled in the polybags in such a way that the upper side of every layer is spreaded by some quantity of spawn and finally polybags were tightened with cotton thread. Each bag was punctured with 30 holes. These bags were then placed in a cropping room where the relative humidity was maintained above 80% and temperature around 17 ± 1^0C. Bags were sprinkled with water twice a day for healthy and proper growth. The mature fruiting bodies were removed from the bags time to time and weighed until they grew to a harvestable size.

Recording of Data

Following parameters were observed and data was recorded:

a) Days for completion of spawn running

Data was accounted in days. It was recorded at 25%, 50%, 75% and 100% spawn running on different substrates.

b) Appearance of pinhead

Data was recorded in days after the completion of spawn running, when pinheads of *Pleurotus florida* starts appearing in each bag.

c) Maturation of pinheads

It is recorded in days. It refers to the time period from appearance of pinheads to maturation of pinheads in all treatments.

d) Flushwise Yield

Yield is measured in grams. Weight of each mushroom harvested in three flushes was recorded. The first and respective harvesting done at maturity as well as number of fruiting bodies of different flushes was also noted.

e) Total yield

The total yield was measured for each treatment in grams. The accumulation of all three flushes was accounted as the total yield of mushroom.

f) Biological efficiency

The biological yield (yield of mushroom/kg substrate on dry wt. basis) of oyster mushroom was determined by the following formula (Cohen *et al.*, 2002) [5].

$$\text{Biological efficiency\%} = \frac{\text{Weight of fresh mushroom fruiting bodies}}{\text{Weight of dry substrate}} \text{X } 100$$

Statistical analysis

The recorded data was analyzed by using analysis of variance (ANOVA) and mean were separated by Least Significant Difference (LSD) test (Steel and Torrie, 1997) [19].

Results and Discussion

Wheat spawn is commonly used for mushroom cultivation because the growth of mycelium was faster on wheat grains (Iqbal, *et al.*, 2016).

Spawn running: It is evident from the Table-1 that spawn running took 3-weeks after inoculation. These results are supported by earlier work done (Tan, 1981) [20] who reported that spawn running took 3- weeks and fruiting bodies appeared after 2-3 days.

Pinheads formation: The pinheads formation is the second stage of mycelium growth during cultivation of mushroom. Small pinheads like structures were observed after 7 days of the spawn running. These results are in agreement with earlier work done (Ahmad, 1986) [1]. who stated that *Pleurotus ostreatus* completed spawn running in 18-20 days on different beds and pinheads formation was noted at 23-27 days interval.

Fruiting bodies formation: This is the third and final stage during the cultivation of mushroom. The fruiting bodies appeared 7 weeks after pinheads formation and took 35 days after inoculation of spawn. Earlier work supports and confirms the findings (Topwal *et al.*, 2016, and Quimio, 1976-1978) [16, 17, 21] and also reported that fruiting bodies were formed at the interval of 3-4 weeks after inoculation of spawn.

Yield of Oyster mushroom: The crop of Oyster mushroom was harvested in three flushes. The maximum yield were obtained in first flush i.e. 648g, as compared to second and third flush i.e. 420g and 259g, respectively. The results are in conformity with the findings of (Khan, 2002, and Shah *et.al., 2004*) [10, 18]. who observed that *Pleurotus ostreatus* gave the maximum yield in the first flush over second and third flush.

Biological efficiency: The Biological efficiency was determined in percentage (%). Observation and calculation determined was 132.7% on the basis of the data given in Table 2. The findings are further supported by work done on oyster mushroom which shows Biological efficiency of 136% (Iqbal *et al.*, 2016) and 132.5% (Topwal *et al.*, 2016) [21].

Table 1: Days taken to spawn running of *Pleurotus florida* on wheat straw

Days taken in Spawn running	13	18	22	26	19.75
Spawn running in (%)	25%	50%	75%	100%	Means

LSD for 25% spawn running = 1.824, LSD for 50% spawn running = 1.656, LSD for 75% spawn running = 1.553, LSD for 100% spawn running = 1.867

Table 2: Days taken in spawn running, pinhead appearance, maturation, flush wise yield (g) and total yield (g) of *Pleurotus florida*

Days taken in Spawn running	Days of pinhead appearance	Days of maturity	Flush wise yield (g)			Total yield	Mean	Biological efficiency (%)
			Flush 1	Flush 2	Flush 3			
19.75	25	28	648	420	259	1327	442.33	132.7

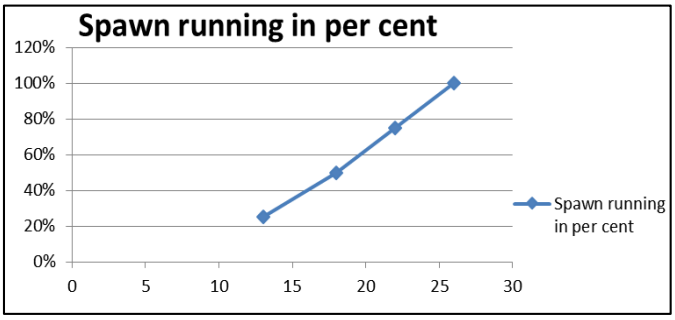

Fig 1: Days for spawn running of *Pleurotus florida* on wheat straw in percentage

References

1. Ahmed I. Some studies on oyster mushroom (*Pleurotus spp.*) on waste material for corn industry. M.Sc. Thesis, University of Agriculture, Faisalabad, Pakistan, 1986, 25-50.
2. Amin SMR, Nirod CS, Moonmoon M, Khandaker J, Rahman M. Officer's training manual. National Mushroom development and extension Centre, Savar, Dhaka, Bangladesh, 2007, 7-17.
3. Banik KS, Nandi R. Effect of supplementation of rice straw with bagasse residual slurry manure on the yield, protein and mineral contents of oyster mushroom. Indian Crop Production. 2004; 20:311-319.
4. Chandha KL, Sharma SR. Advances in Horticulture Mushroom, Malhotra Publication house, New Delhi. 1995; 13:649.
5. Cohen A, Dorffling K, Bettin D, Hahn H. Abscissic acid and cytokinins as possible root to shoot signals in xylem sap of rice plants in drying soil. Australian Journal of Plant Physiology. 2002; 20:109-115.
6. Elmastas M, Isildak O, Turkekul I, Temur N. Determination of antioxidant activity and anti-oxidant compounds in wild edible mushrooms. J Food Compos Anal. 2007; 20:337-345.
7. Furlani RPZ, Godoy HT. Valor nutria cional decogumelos comestíveis. Scientific. Tecnol. Alim. 2007; 27:154-157.
8. Hussain T. Growing mushroom. A New Horizon in Agriculture, 2001.
9. Khan SM, Kausar AG, Ali MA. Yield performance of different strains of oyster mushroom (*Pleurotus* spp.) on paddy straw in Pakistan. Mush. Sci. 1981; 11:675-678.
10. Khan NA, Abbas M, Rehman A, Haq IU, Impact AHM, Sawyerr LCB, *et al*. Yield of seven strains of oyster of sawdust using various woods for effective cultivation of oyster mushroom. Pak. J Bot. 2002; 44(1):399-402.
11. Kurtzman RHJ. Summary of mushroom culture. In Proceedings of Seminar of Mushroom Research and Production PARC, Karachi, Pakistan, 1975, 15-22.
12. Moradali F, Mostafavi H, Ghods S, Hedjaroude A. Immuno modulating and anticancer agents in the realm of macro mycetes fungi (*Macro fungi*). Int. Immunopharmacol. 2007; 7:701-724.
13. Pant D, Reddy UG, Adholeya A. Cultivation of oyster mushrooms on wheat straw and bagasse substrate amended with distillery effluent. World Journal of Microbiology and Biotechnology. 2006; 22:267-275.
14. Quimio TH, Chang ST, Royse DJ. Technical Guidelines for Mushroom Growing in the Tropics, FAO, Plant Production and Protection, paper No 106. Rome, Italy, 1990, 154.
15. Quimio TH. Cultivation of Ganoderma the "Pleurotus-way" mushroom. Newsletter for Tropics. 1976 6(13):121-130.
16. Quimio TH. Indoor cultivation of *Pleurotus ostreatus*. Philippines Agriculturist. 1978; 61:253-262.
17. Royse DJ, Fales SL, Karunanandaa K. Influence of formaldehyde-treated soybean and commercial nutrient complementation on mushroom (*Pleurotussajor-caju*) yield and in-vitro dry matter digestibility of spent substrate. Appl. Micro biol. Bio technol. 2004; 36:425429.
18. Shah ZA, Ashraf M, Ishtiaq MC. Comparative Study on Cultivation and Yield Performance of Oyster Mushroom (*Pleurotus ostreatus*) on Different Substrates (Wheat Straw, Leaves, Saw Dust). Pakistan Journal of Nutrition. 2004; 3(3):158-160.
19. Steel RGD, Torrie JH. Principles and procedures of statistics. McGraw Hill Pub. Co. Inc. New York, 1997.
20. Tan KK. Cotton waste is a good substrate for the cultivation of *P. ostreatus* the oyster mushroom. Mush. Sci. 1981; 11:705-10.
21. Topwal M, Singh SK, JP, Kaushik H, Bijalwan P. Yield Response of Oyster Mushroom (*Pleurotus florida*) On Wheat Straw. Progressive Research – An International Journal, 2016, 5902-5904.
22. Zadrazil F. Cultivation of Pleurotus. In: The Biology and Cultivation of edible mushrooms, Eds., S.T. Chang and W.A. Hayes, Academic Press, USA, 1978, 521-557.