Mycopath (2003), **1**(2): 125-128

Evaluation of different cereal straw for early and high yielding crop of Oyster mushroom, *Pleurotus florida*

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Abstract

The oyster mushroom, *Pleurotus florida* (Strain PK-401) was cultivated on different cereal straws for early and high yielding crop. The wheat and paddy straw, empty corn cobs and millet heads were used as substrate. The earlier pinhead formation and maturation of fruiting bodies were observed in case of empty corncobs, followed by paddy straw, wheat straw and empty millet heads, respectively. The maximum number of flushes was harvested from wheat and paddy straw followed by empty corncobs and millet heads. The less period between flushes was recorded on wheat and paddy straw followed by empty corncobs and millet heads. The maximum fresh yield on percentage of substrate dry weight basis was obtained from wheat and paddy straw followed by empty corncobs and millet heads.

Keywords: Oyster mushroom, *Pleurotus florida*, cereal straw, growth, yield.

Introduction

The mushrooms naturally grow in fields, forests, on manure heaps, along water channels and in hilly areas, mostly during and just after rains. The most popular varieties are *Agaricus bisporus* (European or white button mushroom), *Pleurotus* spp., (Oyster mushrooms), *Volvariella volvacea* (Chinese or paddy straw mushroom) and *Lentinus edodes* (Shiitake mushroom). The oyster mushrooms are amongst most important commercially grown mushrooms, now a days are in competition with button mushroom, *Agaricus bisporus* (Rao, 1991).

The chemical composition of the fresh fruiting bodies of oyster mushrooms varies from species to species. The fresh fruiting bodies contains a large quantity of moisture, whereas fresh as well as dry oyster mushrooms are rich in proteins, fiber and ash; while vitamins such as thiamin, riboflavin and niacin, minerals like calcium, phosphorus, ferric and sodium, are also found present. This mushroom is reputed to be antitumoural because of its chemical composition (Rambelli and Menini, 1985; Pandey and Ghosh, 1996).

The oyster mushroom can be grown under shed and sold either fresh or preserved. Unused stalls, green houses, cellar etc can be economically transformed without an excessive outlay of capital. Different agricultural and or industrial straw wastes can be converted into edible oyster mushroom, because this mushroom grows under natural conditions on living trees as parasite or dead woody branches of trees as saprophyte and primary decomposer. Rao (1991), Suharban, *et al.* (1993) and Abraham and Pradeep (1995) cultivated oyster mushroom on paddy/ rice straw. Patra and Pani (1995) and Singh, *et al.* (1995) also used paddy and wheat straw. Mathew *et al.* (1996) used various substrates, both for spawn production and cultivation of *P. sajor-caju, P. citrinopileatus, P. florida, P. platypus,* and *P. ostreatus*. Labuschagne *et al.* (2000), used wheat straw. The present studies were undertaken to evaluate the best cereal straw for early and high yielding crop of oyster mushroom, *Pleurotus florida* (Strain PK-401).

Materials and Methods

The experiment was laid out as randomized complete block design with factorial arrangement of three replications and four treatments; in the mushroom growing room, Department of Plant Pathology, Faculty of Crop Protection, Sindh Agriculture University, Tandojam.

The culture of *P. florida* (Strain PK-401) was obtained from the fresh fruiting body of the mushroom by tissue culture method. The culture thus obtained was maintained throughout the experimental work on potato dextrose agar (PDA) medium. Whereas, the spawn was prepared and maintained on sorghum grains. The grains were half boiled and sterilized at 15-lbs psi for 20 minutes in conical flasks. The inoculation was carried out on the following day with pure culture of mushroom. The inoculated PDA medium and flasks containing sorghum grains, were incubated at 25 to 30^{o}C for 10 to 15 days.

The residue of four different cereal crops viz. wheat and paddy straw, empty corncobs and millet

heads were used as substrate in polythene bags. Wheat straw and empty millet heads were used as such after threshing. The paddy straw and empty corncobs were chopped into small pieces of about 3-4 cm with the help of fodder chopping machine. All the substrates were boiled for 15-20 minutes without prior soaking, but empty corn cobs were soaked over night first and then were boiled for above mentioned period, so that the straw became soft. The boiled straw was spread in thin layers on clean and inclined cemented floor, till the remaining excess of water was removed. When the temperature of substrates dropped down to about room temperature and moisture content became about 90%. The substrates were then filled in polythene bags. Each bag held 550 g of each substrate on dry weight basis. The bags filled with residue were sterilized in the autoclave at 15 lb/m^2 for an hour. After cooling of sterilized bags, the spawning was done with pure sorghum grain spawn at the rate of 30 grams per bag. The spawned bags were placed in a mushroom growing room, on iron racks in order to provide them maximum space.

Temperature, Humidity and Light

Temperature, humidity, and light are basic factors for the proper growth and development of mushroom. Efforts were made to maintain these requirements by furnishing mushroom growing room (4.2X3X4.2 m) with one desert room cooler and two fluorescent lamps (Philips tube lights, 40 W/54) for the promising cultivation of mushroom. The temperature and humidity remained between 20-30^{O}C and 80-100%, respectively, during the course of experiment. The growth and development of mushroom was observed daily. When the pinheads started appearing on the mycelial surface, the bags were cut-off with blade, to facilitate the development of fruiting bodies. As soon as the fruiting bodies attained full size, these were harvested just above surface of the substrate with blade.

Data Recorded

The time taken for pinhead formation and maturation of fruiting bodies from the date of spawning on residue of different cereal crops was recorded in days. The time taken between flushes was also recorded in days:

The total number of flushes, harvested from each substrate was also recorded. The weight of fresh mushrooms was recorded after harvesting of each flush. The total yield was recorded by adding the fresh weight of mushrooms of all flushes. The fresh yield percentage was calculated on substrate dry weight basis using following formula:

$$\text{Fresh yield (\%)} = \frac{\text{Total yield of all flushes from each replication}}{\text{Substrates dry weight of each replication}} \times 100$$

The data was analyzed by using computer package: " Student Edition of Statistix, version 1.0".

Results and Discussion

Pinhead formation

The pinheads observed significantly earlier from empty corn cobs (45 days after spawning), followed by paddy straw (51), wheat straw (55) and empty millet heads (59 days after spawning), respectively (Fig. 1). Khan (1986) stated 21-28 days), Kausar and Iqbal (1994) and Kausar and Zafar (1995) got pinhead formation 28 days after spawning. Patra and Pani (1995) revealed that mushroom took 20-24 days but Jiskani *et al.* (1999) concluded that pinhead formation took 51 days after spawning in case of using wheat straw. Bughio (2001) obtained pinhead formation on sorghum grains containing wheat straw after 43 days of spawning.

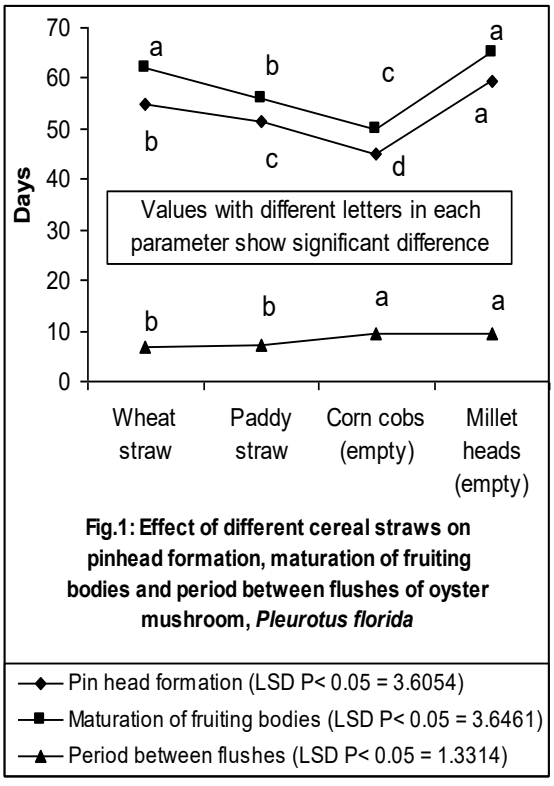

Fig.1: Effect of different cereal straws on pinhead formation, maturation of fruiting bodies and period between flushes of oyster mushroom, *Pleurotus florida*

Maturation of fruiting bodies

The fruiting bodies matured significantly earlier on empty corn cobs (50 days after spawning), following by paddy straw (56 days), wheat straw (62 days) and empty millet heads (65

days), receptively (Fig. 1). Jiskani, *et al*. (1999) recorded 60 days after spawning for maturation of fruiting bodies. Sheikh and Amjad (2000), observed that pinheads converted into mushrooms with in a week, Bughio (2001) found that maturation of fruiting bodies took 5 to 6 days after pinhead formation.

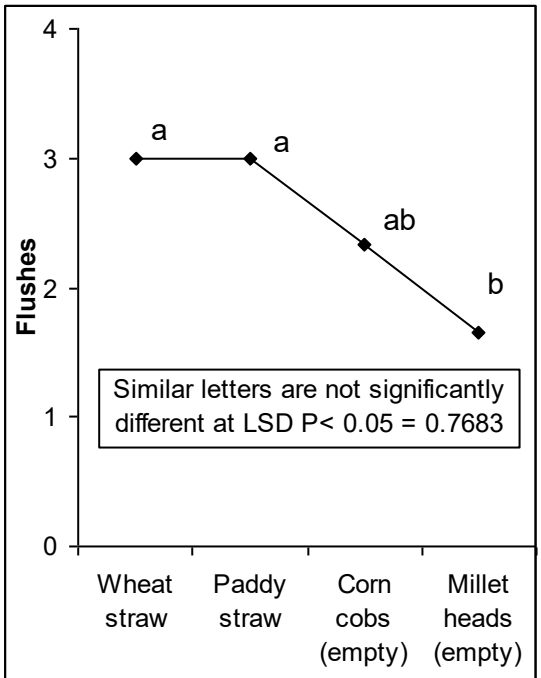

Fig. 2: Effect of different cereal straws on number of flushes of oyster mushroom, *Pleurotus florida*

Period between flushes

The time taken between flushes (Fig. 1) was significantly lower on wheat and paddy straw (7 days) followed by empty corncobs and millet heads (9 days). Khan (1986) stated 7 days intervals, Lozano (1990) harvested seven flushes in 60 days, whereas Jiskani, *et al.* (1999) reported 7 days, but Bughio (2001) recorded 8-14 days between flushes.

Number of flushes

The number of flushes harvested (Figure 2) was significantly higher than wheat and paddy straw (3) followed by empty corncobs (2) and millet heads (1). Khan (1986) got 4 to 6 flushes on an average basis, Lozano (1990) recorded 7, Kausar and Zafar (1995), Jiskani, *et al.* (1999) obtained 3 and Bughio (2001) harvested 3-6 flushes.

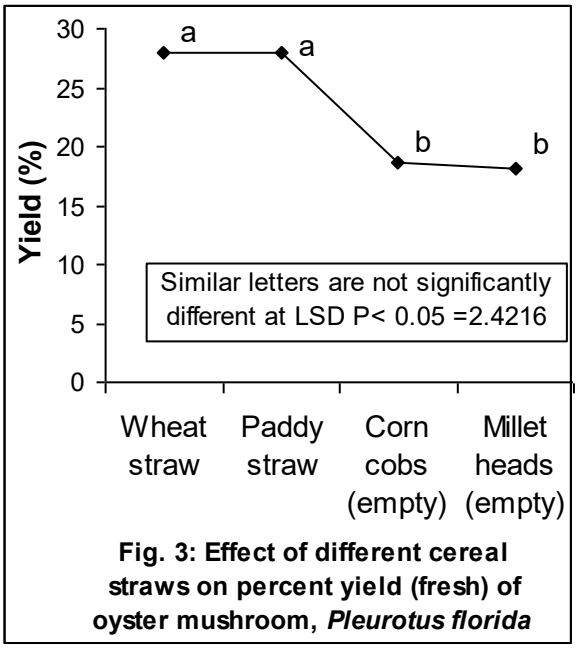

Fig. 3: Effect of different cereal straws on percent yield (fresh) of oyster mushroom, *Pleurotus florida*

Yield performance

The fresh yield of *P. florida* obtained on percentage of substrate dry weight basis was significantly higher than wheat and paddy straw (28 and 27%) followed by empty corncobs and millet heads (18%), respectively (Figure 3). Lozano (1990) obtained 43% yield. Kausar and Iqbal (1994) found that yield varied from 18.6 to 83.5 percent on the basis of different nitrogen supplements amended with straw. Kausar and Zafar (1995) got variation in the average yield ranging from 57.17- 73.39%. Jiskani, *et al.* (1999) obtained 24% fresh yield on the basis of substrate dry weight, in case of using wheat straw. Bughio (2001) obtained the maximum fresh yield i.e. 29.61 to 77.91% on substrate dry weight basis from wheat straw using in combination with cotton boll locules, paddy straw, sugarcane and sorghum leaves at 1:1 ratio.

Conclusion

It is concluded from the present studies that wheat and paddy straw are better substrates followed by empty corncobs and millet heads for getting earlier and high yielding crop of oyster mushroom, *Pleurotus florida*.

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