SCREENING OF DIFFERENT EXOTIC STRAINS OF OYSTER MUSHROOM FOR YIELD PRODUCTION USING COTTON WASTE AND COMBINED WITH RICE HUSK

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ABSTRACT

Three exotic strains of Oyster mushrooms were investigated on cotton waste alone and combined with rice husk to evaluate the effective cultivation of yield production. Among all exotic strains, Pleurotus (sajor caju) pulmonarious (WC-537) not only completed spawn running in a very short period of time but also showed maximum yield of 1111 gm and minimum yield was observed on P. (florida) ostreatus (WC-536) which gave 844 gm on cotton waste alone and in cotton waste + rice husk substrates, again P. (sajor-caju) pulmonarious (WC-537) showed maximum yield which was 926 gm but minimum yield was observed on P. ostreatus (WC-522) which gave 795 gm respectively and cotton waste recommended the best substrate for effective cultivation.

Key words: Oyster mushroom strains, cotton waste, rice husk, spawn running, yield.

INTRODUCTION

Mushroom (Pleurotus ostreatus) (Jacq. Fr.) Quel. var. vulgaris is an edible fungus having excellent flavour and taste. It belongs to class Basidomycetes, subclass Hollobasidiomycetidae and Order Agirciales. It is cultivated in temperate and subtropical region of the world. The technology of artificial cultivation of this mushroom is somewhat recent innovation. Incorporation of non-conventional crops in existing agricultural system can help in improving the social as well as economic status of small farmers. Mushroom is a macro fungus with distinct fruiting body, which can be either epigeous and hypogeous and large enough to be seen with naked eye and to be picked by hand. (Chang and Miles, 1992). Pleurotus spp has been cultivated on substrates such as cotton waste, cereal straw, corn cobs, sawdust, bagasse, wood pulp, banana leaves, coconut husk, tree bark and leaves. A large quantity of these waste material is available in Pakistan (Anonymous 2007). There are many agricultural wastes such as paddy straw, cotton waste, sugarcane bagasse, wheat straw etc. which can be efficiently utilized in the production of mushroom. It is available in abundance in Pakistan and at present is being exported to Korea for the production of oyster mushroom. Therefore, its price is increasing day by day, which results in raising the cost of production. The mushrooms have long ago drawn attention of human beings as a food, nutritionally and medicinally and now-a-days is a leading food component (Iqbal et al., 2005). In order to develop this technology as a cottage industry, exotic strains should be evaluated for its maximum production. The aim of exotic strain is to study the acclimatization of these strains in our climatic conditions and efficiency of cultivated mushrooms. Therefore, the present studies were carried out in selection of high yielding exotic strains to determine the yield performance of Oyster mushrooms on cotton waste substrate alone and its amendment with rice husk for its effective cultivation.

MATERIALS AND METHODS

Collection of three exotic cultures: Three exotic strains which includes P. (sajor-caju) pulmonarius (WC-537) and P. ostreatus (WC-522), P. (florida) ostreatus (WC-536) were procured from the Culture Bank of the Mushroom Laboratory Penn State University, USA.

Multiplication of exotic strains on culture medium: Strains were cultured on Malt Extract Agar medium (MEA) which have following constituents: Malt Extract( 20 gm), Dextrose( 20 g m), Agar Agar
(20 gm), Peptone (1 gm), 1 liter of distilled water. The strains were inoculated in (MEA) in petri plates of 90 mm diameter. These Petri plates were incubated at 25°C. Radial growth was measured with in 3, 5 and 7 days after inoculation.

**Preparation of Exotic Spawn:** 1 kg of wheat grains boiled for 15-20 minutes. Then were spreaded on filter paper for drying to remove the moisture. The grains were putted into flask and autoclaved at 121°C, at 15 psi for half hour. Three exotic cultures were inoculated in an autoclaved wheat grains prepared in the flasks and inoculation was done with the help of sterilized needle. The inoculated material was incubated at 25°C. After 21 days the spawn was ready for the cultivation of exotic Oyster mushrooms.

**Preparation of substrate/ Agricultural wastes:** Cotton waste used alone with 100%, and Cotton waste 50%+Rice husk 50% was used as such. Each treatment was prepared with three replications for three exotic strains. Cotton substrate was obtained from Textiles Mills and rice husk was collected from field area near the Department of Plant Pathology. Cotton substrate was soaked in water for 24 hours to moisten. It stacked on a cemented floor to remove the excess water to get desired moisture (70%). Cotton waste was fermented for 5 days by covering with polythene sheets before filling the bags.1000 gm of each substrate was filled in polypropylene bags and their mouths were plugged by inserting cotton with the help of plastic rings of 2.5 x 1 cm size made from PVC pipe. These bags were autoclaved at 121°C at 15-20 psi for 20 minutes and then taken out and kept for cooling. Then bags were spawned for fructification of mushroom fruiting bodies.

**Spawning of bags:** Spawning of each bag was done at the rate of 56g of spawn for each bag was used in all treatments. These bags were incubated at 25°C±2°C for spawn running under complete darkness in growing room. Temperature was maintained with the help of electric heater. Data was recorded at the number of days taken for full growth (100%) in substrate bags.

**Yield Data:** The data was recorded for the harvesting of mushroom in four flushes. The first harvesting was done on different no. of days. The yield data were in the form of total no.of fruiting bodies per bag, weight of each fruiting body, size of the fruiting body, diameter of pileus in cm.

**Statistical analysis:** The experiment will be laid out in a complete randomized design (CRD) with three replications. The data will be analyzed statistically by using DMR test (Steel and Torrie, 1980).

**RESULTS AND DISCUSSION**

**Mycelial Growth of Exotic Strains of Pleurotus on malt extract medium (MEA):** The studies on the performance of exotic strains showed in Fig (1) that fast growing strain among exotic strains was *Pleurotus (sajor-caju) pulmonarious* (WC-537). On the whole 3, 5 and 7 days the *P. (sajor-caju) pulmonarious* (WC-537) remained significant and statistically different from other exotic strains. Ramzan et al. (1983) reported the mycelial growth of two local isolates of mushroom, isolate of Swat Vally and Changa Manga on malt extract agar medium and on potato dextrose agar medium. Ibekwe et al. (2008) studied the mycelial growth of local Nigerian race and found that on malt extract agar with Getamicin sulphate that mycelial growth is influenced by nitrogen and carbon sources. Khan (2009) studied the local and exotic strains of oyster mushroom on malt extract medium and proved it to be the best medium for multiplying local and exotic strains of *Pleurotus*.

**Spawn Running of exotic strains on Cotton waste:** The spawn running data of different strains of Oyster mushroom i.e. *Pleurotus (Sajor-caju) pulmonarious* (WC-537), *P. ostreatus* (WC-522) and *P. (florida) ostreatus* (WC-536) is shown in Fig 2. Statistically, *P. (Sajor-caju) pulmonarious* (WC-537) showed the best performance.
Proved one of the best strain, When 100% of the spawn running was checked, the effective strain was \( P. \ (Sajor-caju \ ) \) pulmonarious (WC-537) which took 16 days to complete the spawn running. The next effective strain was \( P. \ ostreatus \) (WC-522) which took 18 days to complete the 100% spawn running. The least effective strain was \( P. \ (florida) \) ostreatus (WC-536) which took 19 days to complete the 100% spawn running and these two last strains were again statistically different from the first strain.

**Spawn Running of exotic strains on Cotton waste with Rice Husk:** The results of Fig (3) showed that, the effective strain was \( P. \ (Sajor-caju \ ) \) pulmonarious (WC-537). As far as 100% spawn running on the cotton waste + rice husk is concerned, the effective strain was \( P. \ (Sajor-caju \ ) \) pulmonarious (WC-537) which took 14 days to complete the spawn running and this strain is statistically different from other exotic strains.

**Fig: 2 Showing Comparison of Spawn running on cotton waste (%) (no. of days)**

**Fig: 3 Showing Comparison of Spawn running on cotton waste and Rice husk (%) (no. of days)**
Tan (1981) reported that cotton waste as a substrate for the cultivation of *Pleurotus ostreatus* and other species of *Pleurotus*. The results showed that spawn running took 2-3 days. Khan (2009) reported that WC-537 *Pleurotus* (sajor-caju pulmonarious) took 16.00 days for completion of 100% spawn running followed by other strains.

**Yield performance of exotic strains on cotton waste:** The results of Fig (4) showed that the effective strain was *P. (sajor-caju) pulmonarious* (WC-537). As far as yield of Oyster mushroom as a whole was concerned, the effective strain was *P. (sajor-caju) pulmonarious* (WC-537) which gave 1111 g yield on cotton waste and was statistically different from other strains. The least effective strain was *P. (florida) ostreatus* (WC-536) which gave yield 844 g on cotton waste.

**Yield performance of exotic strains on cotton waste with rice husk:** The results of Fig (5) showed that, the significantly effective strain was *P. (sajor-caju) pulmonarious* (WC-537). In all flushes the effective strain was *P. (sajor-caju) pulmonarious* (WC-537) which gave 926 g yield on cotton waste + rice husk and the least effective strain was *P. ostreatus* (WC-522) which gave 795 g yield on cotton waste + rice husk. Leong (1978) reported that cotton raw waste substrate was found to be superior to rice straw and banana leaf substrate. Iqbal et al. (2005) reported the investigations on the cultivation of oyster mushroom, *Pleurotus ostreatus* (local & exotic strains) and *P. sajar-caju* were conducted to find out the growth and yield performance on different substrates. Sopit (2006) found that during Oyster mushroom cultivation on different cellulosic substrates which include sawdust, peat of coconut husk, narrow leaf cattails and bagasse. The sawdust gave the maximum mushroom yield (536.85 g per kg substrate) and this yield was significantly different to those found from other substrates. Cotton waste produced the best results in terms of yield because cotton has more quantity of cellulose and hemicellulose and digestion of cellulose produces glucose and cellobiose, while digestion of hemicellulose (Albersheim, 1976; Clarke, 1997; Keller, 1993). Since many sugars are released which are converted into sources of carbon when lignocellulosic substrates are digested and more carbon sources will be released from cotton waste. Ikbeke et al. (2008) also reported that the cultivation of Oyster mushroom on different agricultural wastes like millet, corn, rice and rye. Millet gave the highest yield while rye gave the lowest. Khan (2009) studied different strains of oyster mushroom (*Pleurotus spp*) on commonly available agricultural wastes. Exotic strain *P. (florida) ostreatus* (WC-536) produced maximum yield where as *P. cystidiosus* (WC-609) and *P. (flabellatus) djamor* (R-22) gave the minimum yield. But in my results, *P. (sajor-caju) pulmonarious* (WC-537) gave maximum yield. The difference in our results might be some how fluctuated due to environmental situation and genetic make up of exotic strains and used rice husk substrate.
Fig 5: Showing Comparison of Yield performance on cotton waste and Rice husk

REFERENCES