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EFFECT OF DIFFERENT SUBSTRATES ON CULTIVATION OF OYSTER MUSHROOM

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ABSTRACT:

Mushrooms, also called "white vegetables" or "boneless vegetarian meat" is a tasty, nutritious, protein rich vegetarian food, contains huge amount of proteins, vitamins and fiber apart from having certain medicinal properties. The present study was conducted at Sidhi District of Madhya Pradesh on oyster mushroom with different substrates viz., wheat straw, paddy straw and maize leaves, to find out the effect of different substrate on morphological characters, yield and biological efficiency. Results of the study revealed that oyster mushroom can grow on different substrate with varying growth performance. Amongst the different substrates wheat straw was found significantly higher in respect of number and weight of sporophoresas well as yield of sporophores while the least yield was observed in maize leaves.

KEYWORDS: Wheat straw, Oyster mushroom, Biological efficiency

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INTRODUCTION:

Mushrooms have been known as special delicacies in human diets around the world for centuries. Their importance in medicine is now highly recognized (Isikhuemhen, 1999). They also have potential medicinal benefits (Lin, 1995). They are a rich source of nutrients, particularly proteins, sugars, lipids, amino acids, glycogen, minerals as well as vitamins B, C and D (Panjikkaran and Mathew, 2013). Commonly, they are gathered in the wild in many cultures but because of demand, they are now commercially cultivated by man. Mushrooms are propagated by spawn

inoculated into the substrate. Harvesting commences three to five days after mushroom appearance (Chang and Li, 1982). Oyster mushroom ranks second among the edible mushrooms grown throughout the world due to its nutritional and medicinal properties. (Khan et al. 2008).Oyster mushroom cultivation has increased significantly around the world because of its ability to grow in a wide range of temperatures and be harvested year-round. (Amin et al. 2007).Oyster mushrooms can be grown on a variety of plant waste substrates viz. sawdust, wheat straw, paddy straw, maize stalk, soybean straw, sugarcane baggage, corn stalk, corn cobs, waste cotton, leaves and pseudo stem of banana, water hyacinth, duck weed, etc. does not require expensive processing method and culture material (Quimio 1980; Chow 1980; Bano et al. 1979).In the study an attempt has been made toevaluate the yield and yield attributes response of oyster mushroom (Pleurotus sajor-caju) on some locally available substrate as well as to find out the best substrate for mushroom cultivation.

MATERIAL AND METHODS:

The study was undertaken at KVK Sidhi of Madhya Pradesh, India. The spawn of Pleurotus sajor-caju was obtained from Department of Plant Pathology, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur. The spawn of Pleurotus sajor-caju was cultivated on different substrates viz., wheat straw, paddy straw and maize leaves. and these substrates were collected from local agricultural field. The abovesaid substrates were well dried and cut into 4-5 cm pieces and dipped in fresh water for 12 hrs and then boiled in water for 2 hrs and cooled to room temperature and excess of water was drained off to 70 % (Zadrazil 1978). Now the drained substrates were used for spawning. substrates were put in polythene bags of 30 x 20 cm size to 3/4th of its capacity, the bags were tied up and perforated with holes all over the surface for aeration. Bagging was carried out through multilayered spawning. The 10 g of spawn was used for 500 g of each dry substrate.
The inoculated bags were kept in the contamination free room with diffused light and 85% humidity. Approximately 15 days after inoculation the mycelium growth takes place. Then the bags were opened and kept on rack or hang the bags for fruiting (Ingale and Ramteke 2010). The watering in the room and on the bags was given twice a day and humidity was maintained between 80 to 90 percent. The watering was stopped before a day of harvesting and the sporophore were harvested before shedding. Observation on period of spawn run, appearance of pinhead formation, fruiting body formation, stipe length, number and weight of sporophore, yield and biological efficiency were recorded. The Biological efficiency was calculated by dividing average yield of mushroom per bed by dry weight of substrate.

RESULTS & DISCUSSION :

It is evident from Table-1 that least period of time (18 days) was required for spawn run grown on wheat straw substrate while Maize leaves substrate took longer period (19.8 days) for spawn run which is not desirable character of good substrate for spawn run.

The pinhead formation was observed in T1 (13.25 days), followed by T4 (17.75 days), T2 (18.75 days), and T3 (20.25 days). The pinhead and fruiting body formation took least period of time for growth in wheat straw substrate (26.2 & 33.0 days respectively) to other substrate. While average time taken for pinhead formation on paddy straw and maize leaves substrate were 32.8 and 35.6 days respectively. Similarly, average time taken by fruiting bodies formation in paddy straw and maize leaves substrates 39.2 and 42.2 days respectively.

Table 1- Growth performance of Pleurotus sajor-caju cultivation on different substrates.

Substrates	Spawn running (Days)	Pinhead formation (Days)	Fruiting body formation (Days)
Wheat straw	18	26.2	33.0
Paddy straw	19.2	32.8	39.2
Maize leaves	19.8	35.6	42.2
CD (0.05)	1.72	2.11	0.87

The study findings on stipe length, number of sporophore and weight of sporophore of oyster mushrooms revealed highly significant results with varied substrates as shown in Table 2. The best response in the form of stipe length of fruit bodies was significantly varied due to different substrates ranged from 2.16 to 2.75 cm. The maximum stripe length was observed on wheat straw substrate (2.75 cm) followed by Maize leaves (2.48 cm) and minimum length was obtained on paddy straw substrate (2.16 cm).

Number of sporophores were significantly varied with the use of different substrates and ranged from 144.05 to 172.0. The highest number of sporophores were obtained in wheat straw (172.0) while the lowest sporophores were recorded in case of Maize leaves (144.05/kg substrate). Similarly, the weight of sporophore grown on wheat straw was significantly higher (4.25 g) than other substrate. Whereas lowest was observed in maize leaves (3.02 g).

Table 2- Effect of different substrates on Yield attributes of Pleurotus sajor-caju.

Substrate	Stipe length (cm)	Number of sporophore	Average weight of sporophore (g)
Wheat straw	2.75	172.00	4.25
Paddy straw	2.16	161.25	3.98
Maize leaves	2.48	144.05	3.02
CD (0.05)	0.25	1.72	0.22

The highest fruiting body yield was obtained from wheat straw (695.58g/kg) followed by paddy straw (622.72g/kg) as shown in Table 3. The lowest yield of mushroom was observed in Maize leaves (427.50).

The biological efficiency of mushrooms provides the best response estimate of production of economic importance. Maximum biological efficiency (140.25%) was recorded on wheat straw while minimum biological efficiency (85.85%) was recorded on maize leaves. A positive interaction was observed between the number of sporophores and yield.

Table 3: Effect of different substrates on yield and biological efficiency of Pleorotus sajor-caju

Substrate	Yield (g/kg)	Biological Efficiency (%)
Wheat straw	695.58	140.25
Paddy straw	622.72	126.04
Maize leaves	427.50	85.85
CD (0.05)	6.18	1.25

In the present study, wheat straw was found to be a good substrate for the cultivation of Pleurotus sajor-caju, which agrees with previous reports of many scientists. Wheat straw had superior

performance over other substrate by Ali et al. (2007) and Dundar et al. (2008) and Fanadzo et al. (2010).

Maximum biological efficiency was also observed on wheat straw while minimum was recorded on maize leaves. Similar results were recorded by Omoanghe et al. (2009) and Sangitrao (2000) and Taniguchi et al. (2005) on biological efficiency of different varieties of oyster mushrooms.
This study reported that the different substrate has a great impact on yield and BE. These results were almost similar to the findings of Singh et al. (2018), Peksen and Yakupoglu (2009), who reported a positive correlation between yield and BE.

CONCLUSION:

From the present study it is confirmed that oyster mushroom (Pleurotus sajor-caju) can be cultivated on different substrates viz., wheat straw, paddy straw and maize leaves with varying growth performances. In the study the main goal was to find out the effect of different substrate on physical parameters, yield and biological efficiency. Amongst the different substrates wheat straw and paddy straw can be recommended as the preferred substrate for oyster mushroom cultivation. Further studies need to be conducted on the potential of various agricultural wastes on oyster mushroom cultivation.

REFERENCES:

Ali MA, Mehmood MI, Nawaz R, Hanif MA, Wasim R (2007). Influence of substrate pasteurization methods on the yield of oyster mushroom (Pleurotus species), Pak. J. Agric. Sci., 44**(31)**;300-303.

Amin SMR, Nirod CS, Moonmoon M, Khandaker J. Rahman M (2007) Officer's Training Manual-National Mushroom Development and Extension Centre, Savar, Dhaka, Bangladesh 7-17.

Bano Z, Nagaraja N, Rajrathnam S, Pathwardhan MV (1979) Cultivation of Pleurotus spp. In a village model hut. Indian Fd. Packer, 33**(15)**;9-25.

Chang,S.T. and Li, S.F. (1982). In Advances in Agricultural Microbiology,(ed. Subba Rao, N.S.). Oxford and IBH Publ. Co., New Delhi. P677-691.

Chow LP (1980) Utilization of cotton waste substrate with temperature treatment for cultivation of oyster mushroom in Singapore, Singapore J. Pri. Ind. 8**(3)**;21-27.

doi:10.1371/journal.pone.0005977.

Dundar AR, Acay H, Yildiz A (2008) Yield performances and nutritional contents of three oyster mushroom species cultivated on wheat stalk. Afr. J. Biotechnol. 7**(3)**;3497-3501.

Fanadzo M, Zireva DT, Dube E, Mashingaidze AB (2010) Evaluation of various substrates and complements for biological efficiency of Pleurotus sajor-caju and Pleurotus ostreatus. Afr. J. Biotechnol. 9**(5)**;2756-2761.

Ingale A, Ramteke A (2010). Studies on cultivation and biological efficiency of mushrooms grown on different agro- residues, Innovative Romanian Food Biotechnology, 6**(1)**;25-28.

Isikhuemhen, O.S., Okhuoya, J.A., Ogbo, E.M. and Akpaja, E.O. (1999). "Effect of substrates supplementation with nitrogen, phosphorus and potassium (NPK) fertilizer on sporophore yield in Pleurotus tuberregium". Micol Neutropolitant Application, 12**(4)**: 9-21.

Khan MA, Amin SMR, Uddin MN, Tania M, Alam N (2008) Comparative study of the nutritional composition of oyster mushroom cultivated in Bangladesh, Bangladesh J. Mushroom, 2**(1)**;9-14.

Lin, Z. (1995). "Advances in the pharmacology of Tremella polysaccharides". In : Chang, S.T., Buswell, J.A. and Sin-wai (eds.). Mushroom Biology and Mushroom Products. ChineseUniversity Press, Hong Kong. p 370.

Omoanghe Isikhuemhen S, Mikiashvilli AN (2009) Lignocellulolytic enzyme activity, substrate utilization and mushroom yield by Pleurotus ostreatus cultivated on substrate containing anaerobic digester solids. J. Ind. Microbiol. Biotechnol. 36**(14)**;1353-1362.

Panjikkaran, S.T. and Mathew, D. (2013). An environmentally friendly and cost effective technique for the commercial cultivation of oyster mushroom [Pleurotus florida (Mont.) Singer] J. Sci. Food Agric., 93 (2013), pp. 973-976.

Peksen A, Yakupoglu G (2009) Tea waste as a supplement for the cultivation of Ganoderma lucidum . World J. Microbiol. Biotechnol. 25**(31)**;611-618.

Quimio TH (1980) Phillipine mushrooms: Survey and culture of edible ones, In: Cultivation of Edible Mushroom in Tropics, UNESCO, Regional workshop, Manila. Final report.

Sangitrao CS (2000) High production technology for Oyster mushroom Pleurotus sajor-caju (Fr.) Singer. Science and cultivation of edible fungi. Proceedings of the 15th International Congress on the Science and Cultivation of Edible Fungi, Maastricht, Netherlands, 959-962.

Singh, Alka; Yadav, R.K., Singh, D. and Singh, Anju. (2018). Comparative efficacy of different substrates for cultivation and yield performance of oyster mushroom (Pleurotus sajor- caju). Journal of Agrisearch, 5**(3)**;215-217.

Taniguchi M, Suzuki H, Watanabe D, Sakai K, Hoshino K, Tanaka T (2005) Evaluation of pretreatment with Pleurotus ostreatus for enzymatic hydrolysis of rice straw. J. Biosci. Bioeng. 100**(40)**;637- 643.

Zadrazil F (1978) Cultivation of Pleurotus. In the biology and cultivation of edible Mushrooms. Ed: Chang ST and Hayes WA, Academic press, New York, 6**(5)**;521-538.