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Evaluation of Different Substrates for the Production and Economics of Oyster Mushroom (*Pleurotus ostreatus*)

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ABSTRACT

The experiment was carried out at Krishi Vigyan Kendra, Jaunpur of eastern Uttar Pradesh. during 2019. Oyster mushrooms draw their nutritional requirement from a host substrate or the agricultural wastes rich in lignin, cellulose and hemicellulose used for its cultivation. Nutrient content varied with the substrate which lead to varied mushroom yield. An experiment was conducted to evaluate commonly available agro-wastes *viz.,* wheat straw, paddy straw, sugarcane leaves, sugarcane bagasse, stalks of maize, stalk of pearl millet for the cultivation of oyster mushroom (*Pleurotus ostreatus*). Among tested substrates wheat straw was found to yield more yield (710.50 g/ kg dry substrate), biological efficiency, net returns and benefit cost ratio than other treatments.

Key Words: Efficiency, Maize, Oyster, Pearl millet, Stalks, Sugarcane, Wheat straw.

INTRODUCTION

Mushroom is a edible macro fungi which has a distinct fleshy fruiting body. Oyster mushrooms (*Pleurotus sp.)* is one of the most commercially cultivated and useful mushrooms next to white button mushroom (*Agaricus bisporus*) especially in Southeast Asia, India, Europe, and Africa (Sanchez, 2010, Royse *et al,* 2017 and Jennifer and Devi, 2020). Oyster mushroom have many advantages over other mushrooms, which grow under a wide range of temperature (15-30°C) and pH (6-8) (Yingyue *et al,* 2014). Kaur *et al* (2022) revealed that spawning during second week of October and during first week of January were found to be the most beneficial time to get maximum production as well as higher net returns from button mushroom production under Punjab conditions

Mushroom cultivation has become a profitable business with the produce fetching good returns in the market. The oyster mushrooms can also grow on various kinds of lignocellulosic agricultural waste materials as substrate such as wheat straw, sugarcane leaf, paddy straw, maize waste and sugarcane bagasse (Hoa *et al,* 2015). The different types of lignocellulosic agricultural waste are rich in various types of nutrients and disposal of huge quantity of agro wastes is very difficult to manage as excess of nutrients in them can cause leaching is left in field, as a compost. Mostly they are disposed by means of incineration which causes pollution. Hence, there is always a high demand of crop residue management method which is cost effective and contributes less in environment pollution. An attractive feature of oyster mushrooms is that can utilize a large variety of agricultural waste products and transform the lignocelluloses biomass in to high quality food. The potential of bioconversion of lignocelluloses waste into value added mushroom is emphasized in earlier studies (Poppe, 2000). Ashem *et al* (2021) showed that exposure to the training programme and method demonstration increased the skill and knowledge of rural farm women with regard to techniques of mushroom cultivation. Similarly, Kamalabai *et al* (2021) reported that Proper training and guidance to the farmers is essential and would help the interested

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Table 1. Effect of different agro-wastes for production and economics of *P. ostreatus*.

Sr. No.	Treatment	Yield (g/kg substrate)	Biological Efficiency (%)	Gross income (Rs.)	Gross cost (Rs.)	net income (Rs.)	B:C ratio
1.	Wheat straw	710.50	71.05	106.58	42.21	64.37	2.52
2.	Paddy straw	675.70	67.57	101.35	40.87	60.48	2.47
3.	Sugarcane leaves	526.20	52.62	78.93	39.52	39.41	1.99
4.	Sugarcane bagasse	645.53	64.55	96.83	39.15	57.68	2.47
5.	Stalk of maize	624.80	62.48	93.72	40.14	53.58	2.33
6.	Stalk of pearl millet	685.30	68.53	102.80	41.62	61.18	2.46
	CD at 5%	21.87	-	-	-	-	-

growers to sustain and earn their livelihood. Ahir *et al* (2021) revealed that except farming experience, all the variables *i.e.,* age, education, land holding, family income, farming experiences, achievement motivation, economic motivation and knowledge of mushroom production technology were positively and significantly correlated with adoption of mushroom production technology.

Lekha and Muralidharan (2021) indicated that match wood saw dust can be used as an alternative substrate for mushroom production as it is cheaper and yielded at par with rubber saw dust. Radhakrishnan *et al* (2021) showed that milky mushroom production was not beneficial in the study area and banana pseudostem waste was a suitable substrate for mushroom cultivation. They further revealed that unorganized market structure is the major constraint faced by the farmers.

Keeping this in view, present study was carried out to evaluate different agricultural wastes for growth and production of *Pleurotus ostreatus* in climatic condition of eastern Uttar Pradesh.

MATERIALS AND METHODS

The investigations on evaluation of different agro-wastes on yield and economics of oyster mushroom (*Pleurotus ostreatus)* was carried out during the year 2019-2020 at Krishi Vigyan Kendra, Jaunpur (U.P.). The following substrates were used to cultivation i.e. wheat straw, paddy straw, sugarcane leaves, sugarcane bagasse, stalks of maize, stalk of pearl millet. The dry agro wastes were chopped to small pieces (5-8 cm long). In present study, the pure quality spawn of *Pleurotus ostreatus* was obtained from mushroom laboratory, Indian Institute of Vegetable Research, Varanasi (U.P.)

Substrate preparation and sterilization

The chopped substrate were weighed and soaked in into the solution containing appropriate concentration of formalin and Bavistin chemicals for 16-18 hr in fresh water until the moisture content reached about 75%. After soaking substrates were be taken out and excess of water drained off.

Bag filling and spawning

The polypropylene bags of the size 35 × 55 cm^2 will be sterilized with dipping in 2% formalin solution prior to use and lower corners of the bags was tied with the string so that the bed assumes a round shape. Spawn used for spawning in layers was done @ 2 per cent on wet weight basis of the substrate. The bags were filled up to their 85 percent capacity and mouth was closed tightly with threads with the help of sterilized needle, about 25-30 minute holes all-round the filled bags was made.

Incubation and spawn run

A spawned substrate bag was kept in growing room where the temperature and humidity were maintained around 20-25 0C and 80-90%, respectively for 20 days. After completion of spawn run the bags were removed by cutting longitudinally with sharp blade and these bags was kept on bamboo racks/platform at 18-20 0C temperature and 80-90% relative humidity for cropping. Ventilation of 2 to 3 hr/ d was given for maintaining CO_2 level in the growing room and observations regarding days required for pinhead formation were taken at regular intervals. Light spray of water was given to beds twice in a day till the end of cropping seasons. Watering was stopped a day before harvesting. Pinhead initiation was evident within 3-4 days after removal of poly bags. The bags were maintained up to the harvest of the third flush, which was completed in 35-40 days after sowing.

Mushroom yield

The total yields of oyster mushroom were measured for each treatment. The accumulations of three flushes were noted as the total mushroom yield. Harvesting was done by twisting the mushroom fruit body at its base clockwise or anticlockwise. After first harvest, beds were scrapped slightly to remove dead mycelial growth. Then the observations on second and third flushes were taken. Harvested fruiting bodies per bed were collected and fruit body weight was recorded by using electronic balance.

Biological efficiency: The total yield due to different treatments was recorded as g per kg dry substrates used. The yield obtained per bag was expressed in terms of biological efficiency (B.E.) and calculated using following formula (Chang and Miles, 1981).

RESULTS AND DISCUSSION

The observation on yield and economics (Table 1) revealed that among evaluated agro-waste substrate wheat straw was found most suitable for the cultivation of oyster mushroom (*Pleurotus ostreatus*) in the climatic condition of eastern Uttar Pradesh. Wheat straw obtained highest yield of 710.50 g/ kg dry substrate which was significantly superior than other treatments *viz.,* paddy straw, stalk of pearl millet, stalk of maize, sugarcane leaves and sugarcane bagasse. Similar results were also reported by earlier workers (Kirbag and Akyuz, 2008, Pandey *et al,* 2008 and Raja and Ganesh, 2013). Biological efficiency of *Pleurotus ostreatus* was computed since certain substrates were denser than others. The effect of substrates on yield contributing characters such as biological efficiency was varied with the substrates. Maximum biological efficiency 71.05 of mushroom was noticed in treatment in which wheat straw used as substrate. Similar differential biological efficiency of *Pleurotus ostreatus* with different substrates has been reported by Kumar, 2017. The economics of substrates of wheat substrate gave more net returns (Rs. 64.37/ kg dry substrate) and benefit cost ratio (2.52) than other treatments.

CONCLUSION

The results of present study led to conclusion that wheat straw can be used as substrates for the commercial cultivation of oyster mushroom in climatic condition of eastern Uttar Pradesh. Promotion of mushroom cultivation using wheat and paddy straw also leads to eco-friendly way of agro- waste management.

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