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RESEARCH ARTICLE

EVALUATION OF DIFFERENT SPAWNS AND SUBSTRATES ON GROWTH AND YIELD OF PLEUROTUS SAJOR- CAJU

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ABSTRACT

A study was conducted to examine the effect of different types of spawns on oyster mushroom (*Pleurotus sajor- caju*) production using three types of substrates conventional [Soybean straw (SS), Wheat straw (WS) and Paddy straw (PS)] and non conventional [Domestic wastes (DW), Fruit waste (FW) and Used Tea leaves (UTL)]. Locally available grains of wheat (*Triticum aestivum*), sorghum (*Sorghum vulgare*), jowar were used for spawn production. These spawns were used for spawning on the conventional and non-conventional substrates. Various parameters are examined such as spawn run time (mycelia development), pinhead formation, fruit body formation and yield. The experiments were setup as a randomized design with three replicates. Results revealed that wheat grain spawn produced better results in comparison to spawn grown on the maize and sorghum for spawn running, pinhead formation, fruit body formation and increased yield. The quickest spawn running of 17 days, early pinhead formation 21 days, greater yield of 934.4g/Kg with 93.4% BE was recorded with WS as a conventional substrate. Among the non conventional substrate DW was found to be best.

INTRODUCTION

Thus spawn comprises mycelium of the mushroom and a supporting medium which provides nutrition to the fungus during its growth. The propagating material used by the mushroom growers for planting beds is called spawn. The spawn is equivalent to vegetative seed of higher plants (Pathak *et al*., 2000). In mushroom growing technology, the inoculums are known as the 'spawn'. Spawn is a medium that is impregnated with mycelium made from a pure culture of the chosen mushroom strain. Spawn production is a fermentation process in which the mushroom mycelium will be increased by growing through a solid organic matrix under controlled environmental condition. In almost all cases the organic matrix will be sterilized grain e.g. wheat, maize, sorghum etc (Jain and Vyas, 2005; Jain, 2005).

Growing medium of the mushroom is generally known as substrate. The substrates used for cultivation of oyster mushroom are normally nitrogen deficient. An addition of organic and inorganic supplements to the substrate from outside to improve the yield of mushroom have therefore been recommended by many workers (Royse and Schisler, 1987a, 1987b; Royse and Bahler, 1988; Royse, 2002 and Madhusudhanan and Chandra Mohan, 2002; Jain and Vyas, 2002; Jain and Vyas, 2005; Chaubey *et al*., 2010). An attractive feature of oyster mushrooms is that they can utilize a large variety of agricultural waste products and transform the lignocelluloses biomass in to high quality food, flavor and nutritive value (Quimio, 1978; Bano and Rajarathanam, 1982; Dehariya and Vyas,2013). Cultivation of oyster mushroom on Soybean straw and other conventional substrates is cheaper result the reduction in production cost of mushroom and utilizing agric waste would certain help to reduce the environmental problems particularly accumulation of filth carbon sequesters, nutrients, metal sequestration and ultimately mushroom cultivation help us to achieve bioremediation (Dehariya *et al*,2010).

MATERIALS AND METHODS

The spawn production was carried out at the Dept. of Botany, Dr. H.S.G. University, Sagar (M. P.) Experiments were carried out in a Lab of microbial technology and plant pathology. Stock pure culture of *P. sajor caju* obtained from JNKVV, Jabalpur (M.P.) was maintained on Potato Dextrose Agar (PDA).

Spawn preparation

The grains, wheat, maize and sorghum were cleaned manually. The cleaned grains were thoroughly washed and soaked. Thereafter, the soaked grains were drained and the excess water removed, then additives like Chalk powder ($CaCO_3$) at the rate

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of 2%, and Zypsum ($CaSO_4$) at the rate of 0.2% on dry weight basis of the grains were added (Jain, 2005). Calcium carbonate adjust the pH and Zypsum prevent the sticking of grains. The grain substrate was filled in to polypropylene bags. About 200 g of substrate was packed in each bag. The bags were sealed using cotton wool plugged conduit/ poly vinyl chloride pipe rings, and covered by a piece of paper by tying a rubber band around the neck. The bags were autoclaved at 121 ^{o}C, 15 psi, for 30 min and the sterilized bags were allowed to cool for 24 hours. The bags were immediately inoculated with mycelial culture of *P. sajor- caju* maintained on PDA.

Substrate preparation

A medium was prepared using conventional *viz*. soybean straw (SS), wheat straw (WS), paddy straw (PS) and non-conventional substrates *viz*. Domestic wastes (DW), Fruit waste (FW) and used tea leaves (UTL). All the test substrates were washed in fresh water. The chopped straw substrates were steeped in water containing 75 ppm carbendazim + 500ppm formaldehyde for18 hours (Jain, 2005) for preventing mould infestation due to various other compteting fungi. Spawning was done @ 2% wet weight basis of substrate by thoroughly mixing. Spawned substrate is filled up in perforated polythene bags (60 × 40 cm). Three replicates were maintained for each substrates. These bags were transferred to crop room for spawn run. For spawn run temperature and relative humidity were maintained between 30-32^{0}C and 80-90% respectively. Average values for spawn run, pin head appearance and total yield were recorded.

Experimental design

In the experiments complete randomized design with three replicates of each. Wheat spawn, maize spawn and sorghum spawn, in six types of substrates.

Data analysis

Data were analyzed using the analysis of variance (ANOVA) procedure by SYSTAT 12.

RESULT

The results of the present study are summarized and inlet in the tables (1, 2, 3). Table-1 shows growth and yield performance of *Pleurotus sajor-caju* using spawn grown on wheat grain on conventional sources (SS, WS, PS). Among the conventional substrates used, SS gave significantly higher yield (934.4gm/Kg). Similarly among the non conventional substrates (DW, FW, UTL) DW was found best (718.4gm/kg). Table -2 shows results in the same substrates using spawn grown on sorghum grain. Here, again SS (896.7gm/kg) was best among the conventional and DW (690.0gm/kg) was best among the non conventional substrates. Data summarized in table-3 suggest that spawn grown on jowar grain produces better result with SS (870.0gm/kg) and FW (680.0gm/kg).

Irrespective of substrates used for production of *Pleurotus sajor-caju* under the cultivation condition test mushroom utilizes wheat grain more efficiently in comparison to maize grain and sorghum grain.

Table 1 Effect of wheat grain spawn on the growth and yield of *P. sajor-caju* on conventional and non-conventional substrates.

Substrates	Spawn run (day)	Pin head (day)	Stipe length (cm)	Cap diameter (cm)	Total yield (gm./ Kg.)	BE (%)
Conventional						
SS	17.0	21.0	2.7	7.8	934.4	93.4
WS	19.0	23.4	3.0	8.6	800.0	80.0
PS	21.0	24.7	2.8	8.1	750.0	75.0
SEm (±)	0.63	0.66	0.22	0.07	15.24	1.5
CD (0.05%)	2.20	2.30	0.76	0.26	52.7	5.2
Non-conventional						
DW	24.7	28.4	2.5	6.4	718.4	71.8
FW	30.4	35.0	2.7	5.1	635.0	63.5
UTL	25.7	31.4	2.6	5.7	655.0	65.5
SEm (±)	0.57	0.79	0.05	0.11	7.51	0.7
CD (0.05%)	1.99	2.74	0.17	0.39	27.32	2.7

Values are given in average of three replicates

Table2 Effect of sorghum grain spawn on the growth and yield of *P. sajor-caju* on conventional and non-conventional substrates.

Substrates	Spawn run (day)	Pin head (day)	Stipe length (cm)	Cap diameter (cm)	Total yield (gm./ Kg.)	BE (%)
Conventional						
SS	18.7	22.0	2.7	7.6	896.7	89.6
WS	20.0	24.33	2.8	8.5	780.0	78.0
PS	22.0	27.0	2.7	7.9	720.0	72.0
SEm (±)	0.50	0.69	0.06	0.06	6.93	0.6
CD (0.05%)	1.76	2.40	0.21	2.36	24.0	2.40
Non-conventional						
DW	25.4	29.0	2.5	6.3	690.0	69.0
FW	31.0	35.33	2.6	4.3	625.0	62.5
UTL	31.0	35.33	2.6	4.3	625.0	62.5
SEm (±)	0.54	0.63	0.04	0.09	9.57	0.9
CD (0.05%)	1.88	2.20	0.15	0.32	33.12	3.31

Values are given in average of three replicates

Table3 Effect of jowar grain spawn on the growth and yield of *P. sajor-caju* on conventional and non-conventional substrates.

Substrates	Spawn run (day)	Pin head (day)	Stipe length (cm)	Cap diameter (cm)	Total yield (gm./ Kg.)	BE (%)
Conventional						
SS	19.0	22.7	2.7	7.7	870.0	87.0
WS	21.0	25.0	2.6	8.5	760.0	76.0
PS	22.7	27.0	2.8	0.43	710.0	71.0
SEm (±)	0.50	1.24	0.18	0.12	18.70	1.87
CD (0.05%)	1.76	4.31	0.63	0.43	64.73	6.47
Non-conventional						
DW	26.7	30.7	2.5	6.2	680.0	68.0
FW	31.0	35.4	2.6	5.0	616.7	61.6
UTL	27.0	31.0	2.4	5.6	606.7	60.6
SEm (±)	1.24	1.56	0.12	0.18	15.12	1.51
CD (0.05%)	4.31	5.40	0.43	0.63	52.33	5.23

Values are given in average of three replicates

DISCUSSION

Our present study clearly indicates that wheat grains spawn are best for cultivation of *Pleurotus sajor-caju* followed by sorghum grain spawn. Maize grain spawn was comparatively less effective for cultivation of *Pleurotus sajor-caju*. Selection

of a suitable strain is the prime and important aspect in the spawn preparation. Second aspect of a quality spawn is selection of a suitable spawn substrate. Even lot of spawn substrates have been suggested by various workers, grain spawn is mostly suited for oyster mushrooms. Commonly used grains are wheat, sorghum, maize, jowar and paddy. The choice of grain depends on the availability of the same in a particular locality. Variations in spawn run rate and yield may be attributed to the size of the grains. Smaller grains have a greater number of inoculation points per kg than larger grains (Mamiro and Royse, 2008). It was found that the spawn run rate of smaller grains was higher than the larger grains. However, larger grains have a greater food reserve (Elliot, 1985) and can sustain the mycelium for longer periods of time during stress (Fritsche, 1988). Thus, different types of spawn may influence productivity and growth. These observations are in agreement with the result of (Jain, 2005) who also found wheat grains are more suitable for cultivation of *Pleurotus* sp.

Many workers worked on development of different grain spawns and their effect on yield (Elliot, 1985; Fritsche, 1988; Sharma, 2003; Chaurasia, 1997; Royse, 2002; Jain, 2005; Shah *et al*., 2004; Arulnandhy and Gayathri., 2007; Pathmasini *et al*., 2008). Pathmasini *et al*., 2008) used locally available grains of kurakkan (*Eleusine coracana*), maize (broken), sorghum (*Sorghum bicolor*) and paddy (*Oryza sativa)* for spawn production. According to him the kurakkan spawn produced an acceleration of spawn running, pin head formation, fruit body formation and increased yield compared with other types of spawn viz. maize, sorghum and paddy. Shah *et al*., (2004) and Tan (1981) took three types of grain for spawn production kurakkan (*Eleusine coracana*), maize (broken) (*Zea mays*), sorghum (*Sorghum bicolor*) and reported the spawn run appear earlier in kurukkan. Arulnandhy and Gayathri **(**2007) obtained a mean yield of 24 g on sawdust medium. Chaubey, (2010) used wheat, maize and sorghum grain spawn for the cultivation of oyster mushroom. Thulasi *et al*, (2010) reported spawn production of oyster mushroom on different substrates. Khan *et al*, (2011) reported different spawning methods of oyster mushrooms on cotton waste. It is concluded from the present study that all the three grains are suitable for spawn production but wheat grain is more efficient for the spawn production of *Pleurotus sajor-caju.*

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