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EVALUATION OF BANANA LEAF AS A NEW ALTERNATE SUBSTRATE TO PADDY STRAW FOR OYSTER MUSHROOM CULTIVATION

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Different parts of banana leaf such as leaf without midrib, leaf with midrib and midrib were used separately or in combination with paddy straw (1 : 1) for cultivation of 5 species of oyster mushrom. Midrib portion of banana leaf sustained higher yield of test fungi (BE 57.5 to 89.5 per cent) at par with paddy straw (BE 58.7 to 85.2 per cent). Banana leaf with midrib supported a biological efficiency of 22.2 to 36.7 per cent. Banana leaf without midrib appeared to be the poorest substrate (BE 16.5 to 31.7 per cent) for oyster mushroom cultivation. Respective higher yields of the test fungi were obtained when different parts of banana leaf were used in combination with paddy straw (1 : 1) than used alone. The fungi took minimum periods of 15 days and 21 days for complete substrate colonization and initiation of fruiting, respectively in both paddy straw and midrib portion while these were maximum in banana leaf without midrib.

Keywords : Banana leaf; Biological efficiency; Oyster mushroom; Paddy straw.

Introduction

Cultivation of osyter mushroom *(Pleurotus* sp.) is gaining popularity all over the world due to simple cultivation practices and time advantage over other cultivated mushrooms[1]. Paddy straw is the most widely used substrate for it's cultivation in Orissa and other states of eastern and southern India. The production of paddy straw had declined due to introduction of short stature high yielding varities and diversion of rice grown areas for production of more remunerative crops. In this context, utilization of locally available agricultural wastes for successful oyster mushroom cultivation deem fit which will decrease the demand on paddy straw. Several workers have already reported growing of *Pleurotus* sp. on a number of agricultural wastes like wheat straw[2-4], paddy straw[5], hulled maize cobs[6], coca shell waste, soft wood saw dust and oatmeal mixture[7], coffee pulp[8,9], soyabean straw[10], sugarcane bagasse[11], paper waste[12], coir waste[13], saw dust[14], and delonix flowers[15]. Though cultivation of oyster mushroom on balana pseudostem has been reported[16,17], literatures on the utilization of other parts of banana plant for oyster mushroom production are almost absent. Hence this experiment has been conducted to evaluate different portions of banana leaf such as leaf without midrib, midrib and leaf with midrib for their relative efficiency in sustaining the mushroom production in 5 species of *Pleurotus*.

Materials and Methods

Five species of oyster mushroom viz. *Pleurotus sajor-caju* (Fr) Singer, *P. florida* Eger, *P. sapidus* (Schulzer) kalch, *P. citrinopileatus* Singer and *P. flabellatus* (Berk & Br.) Sacc maintained in the laboratory of Centre of Tropical Mushroom Research and Training were used in this experiment. Spawn of individual species was raised on boiled wheat grains mixed with 2% calcium carbonate and 0.5% dextrose[18] in wide mouth

empty saline bottles. One month old spawn of individual species was used for mushroom production.

Dried banana leaves attached to the mother plants were collected and different portions such as leaf without midrib, midrib and leaf with midrib were separated. Paddy straw and the portions of banana leaf were chopped to 3 to 5cm length, soaked in water for12 hours and subjected to boiling water treatment (70 to 80°C) for 30 minutes for sterilization. Cultivation of oyster mushroom was carried out in 150 gauge 40 cm X 80cm polythene bags with 2Kg of dry substrate in each bag. After soaking different parts of banana leaf were filled into the polythene bags separately or in combination with paddy straw (1 : 1). A moisture content of 60 to 70 per cent was allowed in the substrate at the time of filling into the bags. Spawing was done @ 3% of wet substrate in 4 layers with one month old spawn of each test fungi. The open ends of the bags were tied and about 10-15 holes were made around each bag for exchange of gas. The bags were properly labelled and incubated in dark till they were completely impregnated by the mushroom mycelia. The polythene bags were removed and the compact substrate were kept hanging from bamboo racks inside the cropping room. Water was sprayed regularly to keep the bags moist. A temperature of 22 to 28°C and RH of 80 to 85 per cent were maintained during the entire cropping period. Each of the treatment was replicated thrice. Polythene bags containing only paddy straw served as control. Mature fruit bodies were harvested separately from each bag by little twisting at the base and the fresh weight of mushrooms were recorded. Other observations like days taken for complete substrate colonization and appearance of pinheads were also recorded. The biological efficiency was worked out using the following formula :

$$\% \text{ BE} = \frac{\text{Weight of fresh mushroom/bag}}{\text{Weight of dry substrate/bag}} \times 100$$

Results and Discussion

It is revealed from Table 1 that highest yield of *P. sajor-caju* (BE 80 per cent), *P. sapidus* (BE 79.5 per cent), *P. cirinopileatus* (BE 67 per cent) and *P. flabellatus* (BE 58.7 per cent) was recorded in paddy straw while *P. florida* produced highest yield (BE 89.5 per cent) in the midrib portion of banana leaf. Though higher yield as well as biological efficiency of the test fungi were obtained from paddy straw (BE 58.7 to 85.2 per cent) midrib portion of banana leaf also sustained productivity of the mushroom fungi (BE 57.5 to 89.5 per cent) at par with paddy straw. Hence banana midrib could be used successfully as an alternate substrate to paddy straw for cultivation of oyster mushroom. It is desirable that the substrate used for cultivation of oyster, mushroom should sustain minimum 50 per cent biological efficiency of a test fungus. In this context, a combination of paddy straw and banana leaf midrib (1 : 1) sustained satisfactory yield of all the five *Pleurotus* sp. (50.2 to 73.7 per cent BE). The yield *P. florida, P. sajor-caju & P. sapidus* from the combination of paddy straw and banana leaf with midrib (1 : 1) were also satisfactory with biological efficiencies more than 50 per cent.

Table 1. Yield response of 5 *Pleurotus* species to different portions of banana leaf and their combinations with paddy straw.

Sl. No.	Treatment	*P. sajor-caju* (A)	(B)	Yield (g)	*P. florida* (A)	(B)	Yield (g)	*P. sapidus* (A)	(B)	Yield (g)	*P. Citrinopileatus* (A)	(B)	Yield (g)	*P. flabellatus* (A)	(B)	Yield (g)
1.	Banana Leaf without midrib	23	28	522.5 (26.1)	23	28	634.8 (31.7)	23	28	487.3 (23.9)	23	28	449.8 (22.4)	23	28	331.4 (16.5)
2.	Banana leaf with midrib	21	26	600.5 (30.0)	21	26	735.8 (36.7)	21	26	577.8 (28.8)	21	26	454.9 (22.7)	21	26	444.9 (22.3)
3.	Banana leaf midrib	15	21	1585.4 (79.2)	15	21	1790.4 (89.5)	15	21	1500.5 (75.0)	15	21	1255.0 (62.7)	15	21	1150.0 (57.5)
4.	Paddy straw+ banana leaf without midrib (1:1)	19	25	951.6 (47.5)	19	25	975.0 (48.7)	19	25	816.4 (40.8)	19	25	685.4 (34.2)	19	25	578.0 (28.9)
5.	Paddy straw + banana leaf with midrib (1:1)	18	25	1190.5 (59.5)	18	25	1264.8 (63.2)	18	25	1009.5 (50.4)	18	25	825.3 (41.2)	18	25	618.0 (30.9)
6.	Paddy straw + banana leaf midrib (1:1)	16	23	1405.0 (73.7)	16	23	1475.0 (73.7)	16	23	1315.5 (65.7)	16	23	1075.5 (53.7)	16	23	1050.5 (50.2)
7.	Paddy straw Control	15	21	1600.0 (80.0)	15	21	1705 (85.2)	15	21	1590.4 (79.5)	15	21	1340.0 (67.0)	15	21	1175.0 (58.7)

Each observation was the average of 3 replicates. Date in parentheses indicate the biological efficiency of the corresponding yield.

(A) Days taken for substrate colonization.

(B) Days taken for primo-dial initiation.

From the investigation it was also revealed that midrib portion of banana leaf sustained higher productivity of all the species in comparision to other parts. Banana leaf without midrib appeared to be the poorest subsrate supporting a biological efficiency of only 16.5 to 31.7 per cent. Respective higher yield of the test fungi were obtained when different parts of banana leaf were used in combination with paddy straw (1 : 1) than when used alone.

It was also recorded that the mushroom fungi took minimum periods for complete colonization of substrate (15 days) and initation of pinheads (21 days) in both paddy straw and midrib while these were maximum in banana leaf without midrib.

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