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Recycling of Agro-forest Wastes through Mushroom Cultivation

NIVEDITA L. AND N. IRABANTA SINGH
Aerobiology, Microbiology and Plant Pathology Laboratory Department of Life Sciences, Manipur University, Canchipur, Imphal 795003, Manipur

An attempt has been made for recycling the agro-forest wastes through artificial cultivation of different *Pleurotus* spp.. Cultivation trials of seven (7) *Pleurotus* spp. *viz P. ostreatus* (Jacquin) Kummer, *P. flabellatus* (Berk) Sacc., *P. sapidus* (Kalchbr), *P. eous* (Berk.) *P. citrinopileatus* (Fr.) Singer, *P. florida* and *P. sajor-caju* (Fr.) Singer were carried out for two consecutive years in Imphal using locally available agro-forest wastes as substrates like paddy straw, maize straw, pea straw, mustraw straw, banana pseudostem, sugarcane bagasse, coir, rice husk and wastes paper. All the substrates were treated with hot water prior to cultivation. Out of the seven (7) species only *P. ostreatus* and *P. sapidus* were able to produce sporophore on wastes paper substrate but the remaining substrates can be successfully used for the cultivation of all the seven (7) species producing good yield.

Key Words : Artificial cultivation, seven *Pleurotus* spp., agro-forest wastes

INTRODUCTION

The species of *Pleurotus* are versatile mushrooms cultivated on various substrates. Howeer, the yield of *Pleurotus* spp. are not stable and varies with the type of substrates (Singh, 1998). There are various reports on the efforts made by different workers for utilization of different substrates for *Pleurotus* cultivation. Reports on cultivation trials by other workers for different *Pleurotus* spp. *viz P. ostreatus* (Singh, 1998; Salvagi and Salvagi, 1994; Upadhyay and Verma, 2000), *P. flabellatus* (Singh, 1998; Upadhyay and Verma, 2000) *P. eous* (Eswaran *et al.*,1998), *P. sapidus* (Upadhyay and Verma, 2000), *P citrinopileatus* (Gogoi and Adhikary, 2002; Justin *et al.*, 1998; Patra Pani, 1997; Singh *et al.*, 1993; Kalita and Mazumder, 2001), *P. florida* (Geetha *et al.*, 2000; Das *et al.*, 2000), *P. sajor-caju* (Bahukhandi and Manjal, 1989), have revealed the cultivation of *Pleurotus* spp. as a potential source for recycling the agro-forest wastes. Hence, the presentinvestigation was carried using different agro-forest wastes which are easily available in the Manipur state as a substrate for the cultivation of different *Pleurotus* spp.

MATERIALS AND METHODS

Seven (7) *Pleurotus* spp. chosen for artificial cultivation were *P. ostreatus* (Jacquin) Kummer, *P. flabellatus* (Berk & Br.) Sacc., *P. eous* (Berk) Sacc., *P. sapidus* (kalchbr), *P. citrinopileatus* (Fr.) Singer, *P. florida* and *P. sajor-caju* (Fr.) Singer. The substrates used for artificial cultivation were paddy straw, maize straw, mustard straw, pea straw, rice husk, sugarcane bagasse, coir, banana pseudostem, pine needles and wastes paper. The substrates were cut into 3-5 cm long pieces and dried properly before using. The substrates were soaked overnight and then partially pasteurized by immersing them for 2-3 h. in boiling water. Extra water was drained off and then allowed to cool down for sometime. The cooled substrate was then mixed with grain spawn and filled in polythene bag. Spawning was done by layer method @ 100/500 gm dry wt. of substrate. After spawning the open end of the mouth of the polythene bag was then tied using a rubber band. For every treatment three (3) replicates were taken. It was then placed in the Life Sciences Departmental mushroom shed. The bag was then removed after full mycelium run or at the onset of

pin-head initiation. Watering was done twice a day and relative humidity and temperature of the mushroom shed was maintained at 80-90% and 20-30°C. A total of 3-4 flushes could be obtained within 30-45 days.

RESULTS AND DISCUSSION

The cultivation trials was carried out for two (2) consecutive years. All the substrates used other than waste paper could successfully support sporophore production. Of all the seven (7) *Pleurotus* spp. only *P. ostreatus* and *P. sapidus* could produce fruiting body on waste paper. The highest yield for *P. ostreatus* and *P. citrinopileatus* was obtained in case of mustard straw substrate whereas *P. flabellatus* and *P. sapidus* gave maximum yield on pea straw. *P. eous* was found go give maximum sporophore production on rice husk. The highest yield for *P. sajor-caju* and *P. florida* was found in case of paddy straw and banana pseudostem substrate. (Table 1). *P. florida* gave highest yield when cultivated on sugarcane bagasse as compared to other species which is in agreement with the findings of Singh (1998) and Savalgi and Savalgi, (1994) but differed from Nallathambi and Marimuthu, (1993) who reported that *P. platypus* gave highest yield on sugarcane bagasse. *P. ostreatus* was found to give highest yield in case of mustard straw followed by pea straw. Maximum yield was obtained for *P. flabellatus* in case of coir which was different from the finding of Nallathambi and Marimuthu, (1993). In the present study coir as a substrate could successfully support sporophore production for all the species with *P. ostreatus* and *P. flabellatus* showing sporophore production for all the species with *P. ostreatus* and *P. flabellatus showing highest* B. E. of 70.87% and the least was obtained in case of *P. citrinopileatus* which is different from Nallathambi Marimuthy, (1993).

If pine needles are used as substrates the highest yield was given by *P. florida* followed by *P. sapidus* showing B.E. of 60.5% and 60.2% respectively. *P. eous* gave maximum yield in rice husk as substrate. Patra and *Pani* (1997) reported that *P. sajor-caju* and *P. citrinopileatus* could successfully produce sporophore on wastes paper which was different from the present finding as only *P. sapidus* and *P. ostreatus* could produce sporophore.

From the above analysis it can therefore be concluded that the agro-forest wastes such as paddy straw, pea straw, maize straw, mustard straw, rice husk, banana pseudostem, coir, pine needles and waste paper can be recycled through artificial cultivation of *Pleurotus* spp. since it can successfully produce sporophore.

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Table 1 : Yield of different *Pleurotus* spp. in g/500g. Dry weight of Substrates. (Average of Four Replicates for two consecutive years, 2002-2003)

Substrate	*P. ostreatus*		*P. flabellatus*		*P. eous*		*P. sapidus*		*P. citrinopileatus*		*P. florida*		*P. sajor-caju*	
	Mean of 2 years	B.E %	Mean of 2 years	B.E %	Mean of 2 years	B.E %	Mean of 2 years	B.E %	Mean of 2 years	B.E %	Mean of 2 years	B.E %	Mean of 2 years	B.E %
Paddy straw	406.63	92.12	349.76	96.95	390.63	74.12	377.5	75.5	350.63	70.12	307.5	61.5	387.5	77.5
Bagasse	385.63	77.12	371.87	74.37	370.00	72.00	377.5	75.5	335.00	67.00	400.63	80.12	273.75	54.75
Maize straw	401.5	80.3	372.5	74.5	375.00	75.00	381.5	76.3	296.88	59.33	292.5	58.5	271.88	54.55
Mustard straw	501.88	100.36	374.38	74.87	384.25	76.85	337.5	67.4	392.5	78.5	415.00	83.00	372.5	74.5
Pea straw	445.00	89.00	385.63	77.12	370.63	74.12	387.49	77.49	251.87	50.33	395.00	79.00	234.37	46.87
Coir	354.37	70.87	354.38	70.87	301.88	60.33	295.63	59.12	233.00	46.6	345.63	69.12	272.5	54.5
Waste paper	100.56	20.11	—	—	—	—	—	—	—	—	—	—	—	—
Pine nedles	192.87	38.57	200.00	40.00	83.76	12.33	301.00	60.2	176.25	33.23	302.5	60.5	251.25	50.25
Rice husk	406.87	81.37	369.38	73.87	413.75	82.75	323.13	64.62	332.5	66.5	245.00	49.00	223.75	44.75
Banana pseudosten	436.00	87.00	312.38	62.47	204.75	40.95	291.67	58.33	268.33	53.66	433.75	86.75	328.75	65.75

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