UTILIZATION OF TROPICAL SUBSTRATES FOR SPAWN AND FRUITING BODY PRODUCTION OF *AURICULARIA POLYTRICHA*- WOOD EAR MUSHROOM

PRIYA R.U., GEETHA D, DARSHAN S

Abstract: One of the popular mushrooms due to its nutritional and medicinal values, *Auricularia polytricha* or Black Jelly, offers high income to local growers due to its ability to grow and fruit in tropical regions. The availability of a wide variety of agro-industrial byproducts rich in lignocellulose and other materials required for mushroom growth should be explored and used as the substrate ingredients for the cultivation of *A. polytricha* as well as other mushroom species. In this context the present study was undertaken to evaluate the efficacy of different media on production of spawn and fruiting bodies of *A. polytricha*. Six different spawn substrates were evaluated on the basis of number of days taken for maximum spawn run of *A. polytricha*. Paddy grains was found to be the best substrate for spawn run with a minimum of 17 days with thicker and fluffy growth of mycelium in the grains. Different substrates for cultivation of mushroom included Paddy straw, Sawdust of softwood trees, Sawdust of hardwood trees (Rubber), Banana pseudostem, Sugarcane bagasse and Neopeat. Among all the substrates, Sawdust of hardwood trees was found to be best which produced first flush of mushroom in 51 days with an average weight of sporocarp 3.33g, number of sporocarps 28 and biological efficiency 30.2 per cent.

Key words: *Auricularia polytricha,* Spawn madia, Mycelial run, Substrates and Fruiting body production

Introduction: All over the world, great amounts of solid wastes, residues and by-products, produced in the agriculture sector and its related industries are continuously increasing and causing serious environmental pollution problem. One economically suitable solution to the waste is by producing mushrooms using agricultural wastes. Cultivation of edible mushrooms on agricultural residues / wastes, such as palm oil wastes, rice straw, rice bran and sugarcane bagasse, is a value-added process for conversion of the waste materials into food and value-added products for human consumption and benefits. One of the best mushroom candidates to be cultivated on a large scale in tropics using tropical substrates is *Auricularia polytricha*, also known locally as Black ear mushroom. This mushroom ranked number four behind button mushroom (*Agaricus bisporus*), shiitake (*Lentinus edodes*) and osyter mushroom (*Pleurotus* spp.) (Mau *et al*. 2001). The production of Black Jelly mushroom by our local growers is still insufficient and inefficient. However, the yield and quality of spawn of the cultivated mushroom is governed mainly by the genetic makeup of the strain and technology used for spawn production which include the nature of substrates also (Kumar, 1995). So the present study evaluated the efficacy of different substrates for the production of good quality spawn as well as production of black ear mushroom.

Materials and methods:

Spawn production: Mycelia obtained from tissue culture were used to develop grain spawns. different grains *viz*., paddy, wheat, sorghum, ragi, sawdust of hardwood trees and rubber saw dust were tried as per the standard procedure of Sinden (1934). The grains were cooked in boiling water until the seed coat just begins to split open. Then the excess water was drained off and the grains were spread on a clear area for drying. After drying mixed with calcium carbonate at the rate of 30 g per kg of grains. These were separately packed in heat resistant Polypropelene covers (12×6 inches) at the rate of 300 g per bag and sterilized by autoclaving at 1.02 kg/cm^2 pressure and 121 ^{o}C for 2 h. The sawdust spawn was prepared by mixing rubber sawdust or sawdust of hardwood trees (1 kg), rice bran (200 g) and calcium carbonate (40 g), by sprinkling water until moisture reaches 65 % and sterilization done as above (Deepa, 2016). After cooling, the covers were inoculated aseptically with mycelial bits of equal sizes from 10 days old culture of *A. polytricha* and incubated at 26 + 2 ^{o}C for 15 days. The time taken for spawn run, nature of mycelial growth and presence of contaminants were observed and recorded.

Cultivation: In order to find out the effect of different substrates on mushroom production, studies were conducted using different locally available substrates such as paddy straw, sawdust of softwood trees, sawdust of hardwood trees, banana pseudostem, sugarcane bagasse and neopeat. Mushroom beds were prepared as per the procedure described by Baskaran *et al*. (1978). Paddy straw and sawdust of softwood trees and sawdust of hardwood trees were soaked in water containing carbendazim (bavistin) 75 ppm and formalin 500 ppm for 18 hours for sterilization. Then the excess water was drained off and spread it over a silpaulin sheet under sun to reduce the moisture content to 60 %. The beds were prepared by polybag method. Banana pseudostem and sugarcane bagasse were prepared by chopping

the materials into small pieces and dried properly then substrates were sterilized by chemicals. Neopeat blocks were soaked in water first at the rate of 4 litre water per block (650 g), sterilized and beds were prepared as above and the best substrate was selected based on the time taken for complete spawn run, pinhead formation, first flush, total yield, total crop period, average weight of sporocarp, number of sporocarps and biological efficiency.

Results and discussion:

Spawn Production: Paddy grains was found to be the best substrate for spawn run with a minimum of 17 days required for thicker and fluffy growth of mycelium in the grains. Sorghum and Rubber sawdust were found to be next best substrates with similar growth pattern and took 18 days for complete mycelial run. Other grain substrates like Wheat and Ragi took a minimum of 20 and 22 days respectively for the maximum spawn run with a thick growth. Sawdust of hard wood trees was found to be less effective as it required 22.66 days for complete mycelial run with poor growth. Common contaminant observed was *Aspergillus sp*., in all the substrates except Ragi which was contaminated with *Rhozopus sp.* and *Trichoderma spp.* was also present in Paddy grains (Plate 1 and Table 1). In contrast to this Vidyaresmi (2008) reported that maize grain was found to be the best substrate for spawn run, whereas Upadhyay (1999) concluded that autoclaved wheat grain was excellent spawn for *Auricularia spp.*

Cultivation: Sugarcane bagasse was found to be significantly superior to other substrates for complete mycelial run (29 days) which was followed by Paddy straw which took 32 days. Banana pseudostem and Neopeat were found to be on par with each other and took 36 and 37 days for complete mycelial run. Sawdust of hardwood trees took maximum of 42 days for complete mycelial run. In case of time taken for pinhead formation, Sugarcane bagasse took minimum of 34.33 days which was followed by Paddy straw, Neopeat, Sawdust of softwood trees and Sawdust of hardwood trees which took 38, 43.66, 45, 48.33 days respectively. Among all the substrates, Sawdust of hardwood trees (Rubber saw dust) was found to be the best. Since it was the only substrate to produce first flush of mushroom, average weight of sporocarp (3.33g), number of sporocarps (28) and biological efficiency (30.2 per cent) (Plate 2 and Table 2). The total crop period was 85 days. *Coprinus spp, Aspergillus spp and Trichoderma spp* were the major contaminants found in all the substrates used. The present study indicated that Sawdust of hardwood trees is suitable for cultivation of *Auricularia polytricha*. This study is in line with study conducted by Thakur and Bhandal (1993) who reported sawdust as the most suitable substrate for the cultivation of *A. polytricha.*

Table 1: Evaluation of different substrates for spawn production – *Auricularia polytricha*

Sl no.	Spawning materials	Time taken for spawn run (days)*	Nature of mycelia growth	Contaminants observed
1	Paddy grains	17.00^{d}	++++	*Trichoderma spp., Aspergillus spp*
2	Wheat	20.00^{bc}	+++	*Aspergillus spp*
3	Sorghum	18.00^{cd}	++++	*Aspergillus spp*
4	Ragi	22.00^{ab}	+++	*Rhizopus spp.*
5	Sawdust of hardwood trees	22.66^{a}	++	*Aspergillus spp*
6	Rubber sawdust	18.66^{cd}	+++	*Aspergillus spp*
	CD (0.005)	2.371		

++++ - Thicker and fluffy growth +++ - Thick growth ++ - Poor growth * Average of three replications Means followed by similar superscripts are not significantly different at 5% level

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Table 2: Evaluation of different substrates for mushroom production – Auricularia polytricha

Sl no	Substrates	Time taken for complete spawn run (days)*	Time taken for pinhead formation (days)*	Time taken for first flush (days)*	Total crop period (days)*	Average weight of sporocarp (g)*	Number of sporocarps*	Total yield from three harvests (kg/kg dry weight of substrate)*	Biological efficiency (BE) for three harvests	BE for 8 harvests
1	Paddy straw	32.000^{d}	38.000^{c}	0.000^{b}	0.000^{b}	0.000b	0.000b	0.000b	0.000b	0.000b
2	Sawdust of softwood trees	39.000^{b}	45.000^{b}	0.000^{b}	0.000^{b}	0.000b	0.000b	0.000b	0.000b	0.000b
3	Sawdust of hardwood trees	42.000^{a}	48.333^{a}	51.000^{a}	85.000^{a}	3.333a	28.000 a	0.108 a	10.8 a	30.2 a
4	Banana pseudostem	36.000^{c}	0.000^{e}	0.000^{b}	0.000^{b}	0.000b	0.000b	0.000b	0.000b	0.000b
5	Sugarcane bagasse	29.000^{e}	34.333^{d}	0.000^{b}	0.000^{b}	0.000b	0.000b	0.000b	0.000b	0.000b
6	Neopeat	37.000^{c}	43.666^{b}	0.000^{b}	0.000^{b}	0.000b	0.000b	0.000b	0.000b	0.000b
	CD (0.05)	1.771	2.810	0.723	1.456	0.119	0.723	0.018		

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Plate1: Spawn

Plate 2 : Fruiting Bodies

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Priya R.U., Geetha D, Darshan S
College of Agriculture, Vellayani, Kerala Agricultural University, Trissur, India.