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Growth of Pleurotus Eous on Different Agrowastes

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Abstract

The study investigates the growth potential of *Pleurotus eous* on various locally available agro-wastes to assess their effectiveness as substrates. Common agro-wastes such as wheat straw, paddy straw, sugarcane bagasse, sawdust, and banana leaves were selected. The growth parameters including mycelial colonization period, pinhead initiation, fruiting body development, yield, and biological efficiency were recorded. Results revealed significant differences in growth performance across substrates, with wheat straw (83 % BE) and paddy straw (81 % BE) supporting the most efficient growth than other agrowastes. This study highlights the potential of sustainable mushroom cultivation using readily available agricultural residues.

Keywords: *Pleurotus eous,* agro-wastes, mycelial colonization period, pinhead initiation, biological efficiency.

1.Introduction-

Mushrooms are fleshy fruiting bodies that belong to the members of Basidiomycotina. Mushroom cultivation is a sustainable biotechnology that converts lignocellulosic agrowastes into high-value protein-rich food. Mushroom mycelium grows in and around the substrate, then produces enzymes to digest the food externally, and mycelium absorbs the nutrients (Yafetto, 2018). Oyster mushrooms typically grow on wood and other lignocellulosic substrates undergoing decomposition (Bonatti et al 2004). Different Pleurotus species can be commercially cultivated such as *P. flabelltus, P. sajor caju, P. sapidus, P. membranaceous, P. citrinopileatus, P. eous, P. ostreatus, P. florida, P. cornucopiae, P. fossulatus, P. eryngii* etc. (Chitra et al., 2021). Among these mushrooms, *Pleurotus eous*, commonly known as pink oyster mushroom, is gaining attention due to its fast growth, adaptability, nutritional value, and ability to grow on a wide variety of agrowastes. Large scale cultivation of *P. eous* using suitable substrates can help people in rural areas to raise their income. According to Chang and Miles nutrient content of substrates affects the growth and formation of fruit bodies of Pleurotus species. Biological efficiency is a major parameter to measure the potentiality of various strains of mushrooms,grows on different substrates (Biswas and Layak, 2014). Biological efficiency (BE) is defined as the ratio of the weight of freshly harvested basidiocarp by dry weight of the substrate, expressed in percentage. Now-a-days the Biological efficiency, production and productivity of the mushrooms are decreasing and a lot of factors such as the methods of bed preparation, quality of spawn and substrate, several competitor molds and fungi, environmental factors etc. are responsible for this. A number of scientists are involved to find more potential and efficient way to increase the biological efficiency through various mushroom based researches. Agrowastes such as paddy straw, wheat straw, sugarcane bagasse, and sawdust pose serious environmental disposal problems when not reused. The cultivation of *Pleurotus eous* on these substrates not only provides a solution for waste management but also serves as an economically viable option for rural and peri-urban communities. This study aims to evaluate the efficiency of different agrowastes in supporting the growth and yield of *Pleurotus eous*, thereby determining the most suitable substrate for commercial cultivation.

2.Materials and Methods

2.1. Strains of Mushroom: *Pleurotus eous* strain was obtained from National Centre for Industrial Microbes, National Chemical Laboratory, Pune, India. The cultures were preserved on 2 % malt extract agar slants at 4º C. Sub-culturing were done after every 15 days interval.

2.2. Spawn Preparation and Inoculation

Spawn was prepared in polythene packets. Sorghum grains were boiled in water bath for 10-15 min in the ratio of 1:1 (Sorghum grains: water) and mixed with 4% (w/w) CaCO3 and 2% (w/w) CaSO4. Sorghum grains were then packed (250g) in polythene bags (of

200x300 mm. size) and sterilized in an autoclave at 1210C for 30 min. After sterilization, the bags were inoculated with actively growing mycelium of the *P. eous* from malt extract slants and incubated (at 27±2 ºC) for mycelial growth without any light for 10-15 days until the mycelium fully covered the grains.

2.3 Experimental details.

Experiment was conducted in Randomized block design with five replications.

2.4. Cultivation of Mushroom. The agro waste such as paddy straw (PS), wheat straw (WS), Sugarcane bagasse (SB), Sawdust (SD) and Banana leaves (BL) were collected from local farms and were used as cultivation substrate. The substrates were chopped to 2-3 cm. pieces and soaked in water over night to moisten it and excess water was drained off. After soaking, the substrate was steam sterilized at 121 ºC for 20 min. in an autoclave. The polythene bags of the size 35 x 45 cm were filled with sterilized substrates and a multi layered technique was adopted for spawning. Each bag was filled with 1 kg dry substrate and the spawn was added at the rate of 2% of the wet weight basis of substrate. After inoculation, the bags were kept in house where the temperature and humidity were maintained around 25 ºC and 80 to 90 % respectively with sufficient light and ventilation. The spawn run was completed within 13 to 21 days. The polythene bags were tear-off following the spawn run. Formation of fruit bodies was evident within 3-4 days after removal of poly bags. The beds were maintained up to the harvest of the third flush, which was completed in 35 days after spawning. A small layer of substrate was scrapped off from all the sides of the beds after each harvest.

2.5. Parameters Observed

- Mycelial colonization period (days)
- Days to pinhead initiation
- Days to fruiting
- Yield (g)
- Biological Efficiency (BE%)

2.6. Statistical Analysis

The recorded data in the present study was subjected to statistical analysis as per the procedure recommended by Panse and Sukhatme (1978).

2.7 Yield and Biological efficiency:

The total weight of all the fruiting bodies harvested from all the three pickings were measured as total yield of mushroom. The biological efficiency (yield of mushroom per kg substrate on dry weight basis) was calculated by the following formula Chang et al. (1981).

2.8 Biological Efficiency (%) = (Fresh weight of mushroom/Weight of Air-dried substrate) ×100

3.Results and Discussion

3.1. Mycelial Colonization

Mycelial growth was fastest in wheat straw and paddy straw substrates (13–15 days), whereas sugarcane bagasse and sawdust showed delayed colonization (19–21 days). Banana leaves had moderate colonization time.

Substrate	Mycelial Colonization (days)
Wheat straw	13 ± 0.6
Paddy straw	14 ± 0.5
Banana leaves	16 ± 0.6
Sugarcane bagasse	20 ± 0.7
Sawdust	21 ± 0.8

3.2. Pinhead Initiation and Fruiting

Pinheads appeared earliest in wheat and paddy straw (3–4 days after full colonization). Fruiting was delayed in sawdust and bagasse due to dense substrate structure and low porosity.

Yield and Biological Efficiency

Wheat straw recorded the highest yield (830 g/kg straw) and BE (83 %), followed by paddy straw (810 g/kg straw) and BE (81 %). Sawdust and sugarcane bagasse had the lowest yield and BE due to poor aeration and nutrient composition. Earlier Patil and Baig (2023) also reported 83.06 % BE on soybean straw, 71.73 % BE on paddy straw with *P. sajor-caju* mushroom cultivation.

Substrate	Yield (g)	BE (%)
Wheat straw	830 ± 16	83 ± 1.5
Paddy straw	810 ± 14	81 ± 1.3
Banana leaves	780 ± 17	78 ± 1.6
Sugarcane bagasse	720 ± 19	72 ± 1.5
Sawdust	670 ± 21	67 ± 1.8

3.4. Discussion

The higher performance of wheat and paddy straw may be attributed to their loose structure, better moisture retention, and higher cellulose content favourable for enzymatic breakdown by *Pleurotus* spp. In contrast, sawdust and bagasse are more lignified, requiring pre-treatment or supplementation for optimal results. Banana leaves offer a moderate alternative where cereal straw is unavailable.

4. Conclusion

This study demonstrates that *Pleurotus eous* can effectively grow on a range of agrowastes, with wheat and paddy straw being the most suitable substrates in terms of yield and biological efficiency. Banana leaves also represent a viable option, particularly in tropical regions. Utilizing agrowastes for mushroom cultivation not only enhances resource recycling but also contributes to sustainable food production and rural livelihoods.

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