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Performance of Various Substrates in the Cultivation of Oyster Mushroom (*Pleurotus sajar-caju*)

S. Chandraprakash[1]*, CM. Kamalasuriyan [1], R. Praviin Kumar[1], K. Manoj [1], GJ. Pradesh [2], R. Naveen Kumar[2], K. Dinesh Kumar[2], S. Kalaiamutan[2], G. Dinesh Kumar[2] and C. Partheeban[3]

[1*] Department of Crop Protection, PGP College of Agricultural Sciences, Palani Nagar, Namakkal 637 405, T.N., India
[1&2]Department of Crop Protection, Ramakrishna Mission Vivekananda Education and Research Institute (RKMVERI), Faculty Centre for Agricultural Education and Research (FAR), Coimbatore 641 020, T.N., India
[3] Department of Crop Management, Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI), Faculty Centre for Agricultural Education and Research (FAR), Coimbatore 641 020, T.N., India

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ABSTRACT

Oyster mushrooms are considered an important health food all over the world. There are various varieties of mushrooms cultivated by the growers. The experiment at Ramakrishna Mission Vivekananda Educational and Research Institute, Faculty Centre for Agricultural Education and Research, Coimbatore was designed to assess the performance of the oyster mushroom *Pleurotus sajar-caju* in various substrates and to identify the best substrates for cultivation. Six different substrates (viz., paddy straw, sugarcane bagasse, teak leaves, forest waste, turf waste, and bamboo leaves) were used for oyster mushroom production. T3-Forest waste and T1-Sugarcane Bagasse had the shortest spawn running durations (20 and 20.3 days, respectively), followed by T2 and T5-teak and bamboo leaves (22.3 days). Among the six substrates, T0-Paddy straw (570 g) produced a significantly higher yield, followed by T4-Turf grass (467 g).

Key words: *Oyster mushroom, Pleurotus sajar-caju, Various substrates, Yield performance*

Introduction

Mushroom

Mushrooms are fleshy fruiting bodies belonging to their own kingdom called fungi. Mushrooms differ from other kingdoms as they lack chlorophyll, so they depend on dead and decayed matter for their survival. Mycelium runs mycelium in and around the substrate, then produces enzymes to digest the food externally, and mycelium absorbs the nutrients (Yafetto, 2018).

Oyster mushroom

The oyster mushroom is the third largest cultivated mushroom in the world. *Pleurotus* is an efficient lignin-degrading mushroom and can grow well on different types of lingo-cellulosic materials. Among all cultivated mushrooms, *Pleurotus* has the maximum number of commercially cultivated species suitable for year-round cultivation. Species commercially cultivated during the summer months are *P. flabelltus, P. sajor-caju, P. sapidus, P. membranaceous, P. citrinopileatus, P. eous* etc., and cultivated during the winter are *P. ostreatus, P. florida, P. cornucopiae, P.*

fossulatus, P. eryngii etc. (Chitra *et al.,* 2021).

Pleurotus sajar-caju

Pleurotus sajor-caju is a commercially cultivated species of oyster mushroom. *Sajor-caju* has a high protein content and a low fat content. It also contains vitamins (B1, B2, C, A), minerals (P, Na, Ca), and a high content of fibres and carbohydrates. *Pleurotus sajor-caju* exhibited strong antioxidant properties. It also showed moderate antibacterial activity against *Streptococcus aureus* and *Vibrio cholerae*. The presence of vitamins and carotenoids in *sajor-caju* can also play a protective role in diseases such as cancer and cardiovascular disease. The species is also known to possess antineoplastic (inhibiting or halting the development of a tumor, i.e., neoplasm) properties.

Keeping in view of the above aspects, the present study aimed to assess the performance of the different substrates on oyster mushroom (*Pleurotus sajor-caju)* cultivation.

Materials and Methods

The present investigations on the 'Performance of Various Substrates in the Cultivation of Oyster Mushroom (*Pleurotus sajar-caju*)' were carried out on 2022 in the mushroom cultivation shed, Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI), Faculty Centre for Agricultural Education and Research (FAR), Coimbatore, which is situated at 11.137501° latitude and 76.942355° longitude and at an elevation of 432m above MSL.

Obtaining the substrates

Paddy straw, sugarcane bagasse, teak leaves, forest waste, turf grass, and bamboo leaves used in the experiment as substrates were obtained from the campus premises.

Spawning source

The spawn of *Pleurotus sajar-caju* was purchased from the Department of Plant Pathology, Tamil Nadu Agricultural University.

Pre-Treatment of Substrate

The dried substrates were chopped into 3-5 cm pieces and soaked in fresh water for 8–16 hours. After removing the excess water from the substrates, the wet substrates were filled into gunny bags. Water was boiled in a wide-mouth container such as a tub or drum. The filled bag was dipped in hot water at 80-85°C for about 10-15 minutes. The pasteurised substrate was shade dried to attain a 60% moisture content. Spawning was done when the moisture content of the substrates was around 60% (Sonalli and Randive, 2012).

Mushroom bed preparations

The polythene cover with a 60 x 30 cm size and an 80-gauge thickness was taken and also tied at the bottom end with a thread and turned inwards. The well-grown bed spawn is divided into two halves. (Two beds were prepared from the single spawn.) The straw was filled to a height of 5 cm at the bottom of the polythene cover, and a handful of spawn was sprinkled over the straw layer, concentrating more on the edges. Similarly, five layers of straw and spawn were filled into the cultivation bag layer by layer. From the second layer onwards, maintain the straw height of up to 10 cm. Each layer of straw was gently pressed, and the polythene cover was tied at the top with a thread. For each bed, 1000 g dry weight of chopped sterilised straws and 150 g of spawn were used. The beds were hanged inside the mushroom cultivation shed (Sonalli and Randive, 2012).

Harvest

Harvesting: The fruiting pin heads started to appear in about two weeks of spawning. These would mature with a lobbed appearance. The right stage for picking can be judged by the shape, texture, and size of the fruit. In young mushrooms, the edge of the cap is thick and the cap margin is enrolled even as the cap of a mature mushroom grows to be flat and inward curling starts to evolve. The matured mushrooms were handpicked in a hygienic manner. The mushrooms are detached from the bags and collected in trays, cleaned, weighted and packed. Mushrooms were weighed after each harvest. On average, three harvests were done. The weight of the final substrate was also taken (Dubey *et al*., 2019).

Assessment of the Biological Efficiency of Mushrooms

The biological efficiency of mushrooms on a fresh weight basis was calculated by using the formula given by Anita Kumari *et al*., 2018.

Biological efficiency (%) = (Yield of fruiting body (g)/Total dry weight of substrate used (g)) × 100

Statistical analysis

A completely randomized design (CRD) was employed for all the experiments. All the data was statistically analysed. The Critical Difference (CD) was calculated at a 5% probability level (Siddhante *et al.*, 2013).

Results

The results of the investigations into the "Performance of Various Substrates in the Cultivation of Oyster Mushroom (*Pleurotus sajar-caju*)" are presented.

Spawn running

T3-Forest waste and T1-Sugarcane bagasse had the shortest spawn running durations (20 and 20.3 days, respectively), followed by T2 and T5-teak and bamboo leaves (22.3 days) (Table 1).

Harvest and yield performance

The forest waste and sugarcane bagasse supported early harvest (23 & 23.3 days). The days for the first harvest were delayed in T4–Turf grass (28 days) and T0–Paddy straw (28.3 days) (Table 1). The study confirmed that the use of different substrates brought about a significant (P 0.05) effect on the yield of *Pleurotus sajar-caju*. T0–Paddy straw (570 g) produced the highest yield, followed by T4–Turf grass (467 g), T1–Sugarcane bagasse (376.33 g), T2–Teak leaves (257.67 g) and T3–Forest waste (248 g). T5-Bamboo leaves (237 g) produced the least {Table 1; Plate 1(a), 1(b), 1(c), 1(d), 1(e), 1(f)}.

Sporocarp

Among the various substrates, T1 – Sugarcane bagasse substrate produced the maximum size of sporocarp (7.00 cm), followed by T2 – Teak leaves produced sporocarp (6.5 cm), T0 – Paddy straw (6.1 cm), T3 – Forest waste (6.00 cm), T5-Bamboo leaves (6.00 cm). T4–Turf grass produced the smallest sporocarp (5.7 cm) (Table 1).

Plate 1(a). Growth of Oyster Mushroom (*Pleurotus sajar-caju*) on Paddy straw

Plate 1(b). Growth of Oyster Mushroom (*Pleurotus sajar-caju*) on Sugarcane Bagasse

Table 1. Performance of Various Substrates in the Cultivation of Oyster Mushroom (*Pleurotus sajar-caju*)

Treatments	Substrates	Days for spawn run* (days)	Days for Bud Initiation* (days)	Days for First Harvest* (days)	Yield* (g)	Biological efficiency* (%)	Stipe length* (cm)	Cap diameter* (cm)
T0	Paddy Straw	25.00	26.00	28.30	729.61[a]	72.96[a]	2.70	6.10
T1	Sugarcane bagasse	20.30	21.30	23.30	372.70[c]	37.27[c]	3.50	7.00
T2	Teak Leaves	22.30	23.60	27.00	366.02[c]	36.60[c]	3.20	6.50
T3	Forest waste	20.00	21.00	23.00	278.69[d]	27.87[d]	2.00	6.00
T4	Turf Grass	24.60	25.60	28.00	575.77[b]	57.58[b]	2.80	5.70
T5	Bamboo Leaves	22.30	23.30	25.30	281.20[d]	28.12[d]	3.00	6.00
	CD (0.05)=	3.9335	3.9335	4.4178	37.9369	3.7945	0.1875	0.2097

*Average of Three replications

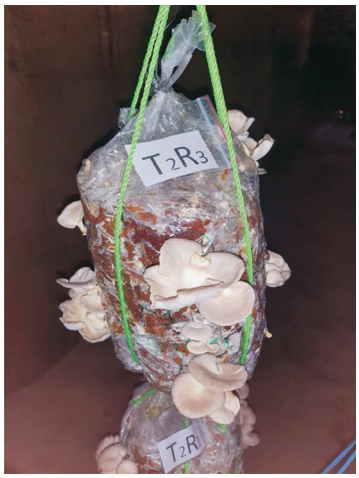

Plate 1(c). Growth of Oyster Mushroom (*Pleurotus sajar-caju*) on Teak Leaves

Plate 1(d). Growth of Oyster Mushroom (*Pleurotus sajar-caju*) on Forest Waste

Plate 1(e). Growth of Oyster Mushroom (*Pleurotus sajar-caju*) on Turf Grass

Discussion

Dubey *et al*., (2019), selected various substrates as treatments for the cultivation of oyster mushrooms

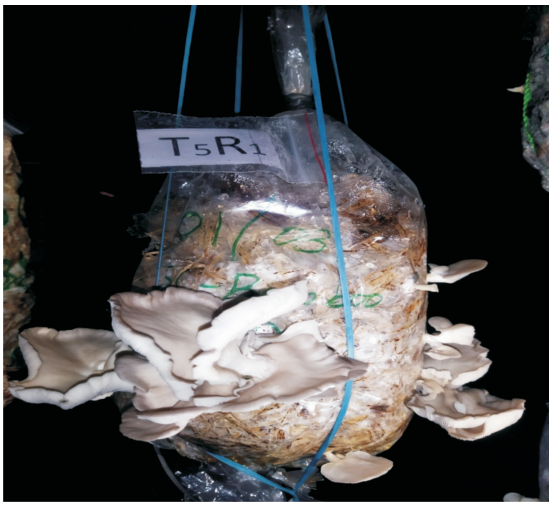

Plate 1(f). Growth of Oyster Mushroom (*Pleurotus sajar-caju*) on Bamboo Leaves

Plate 2. Grown mushrooms in a mushroom cultivation shed

(*Pleurotus sajar-caju):* rice straw, wheat straw, banana leaves, and sugarcane bagasse, each weighing 4.5 kg and replicated four times. The experimental design used was a single-factor, completely randomised design (CRD). The highest yield (150 g), with the highest stipe length (4.86 cm) and cap diameter (5.14 cm), was obtained from the rice straw, followed by other substrates. The colonisation duration (19 days) was lower for wheat straw and banana leaves, while the fruiting duration (20.5 days) was lower in the case of wheat straw.

In general, the demand for oyster mushrooms in the market has been increasing day by day. Paddy straw produced a significantly higher yield, followed by turf waste. Although paddy straw is com-

mercially used as a substrate for mushroom cultivation, turf waste may be the best alternative substrate when compared to other substrates such as sugarcane bagasse, teak leaves, forest residue, and bamboo leaves.

Hence, the present investigation will have held the mushroom growers to the selection of *paddy straw* for cultivation of oyster mushroom (*Pleurotus sajar-caju)*.

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