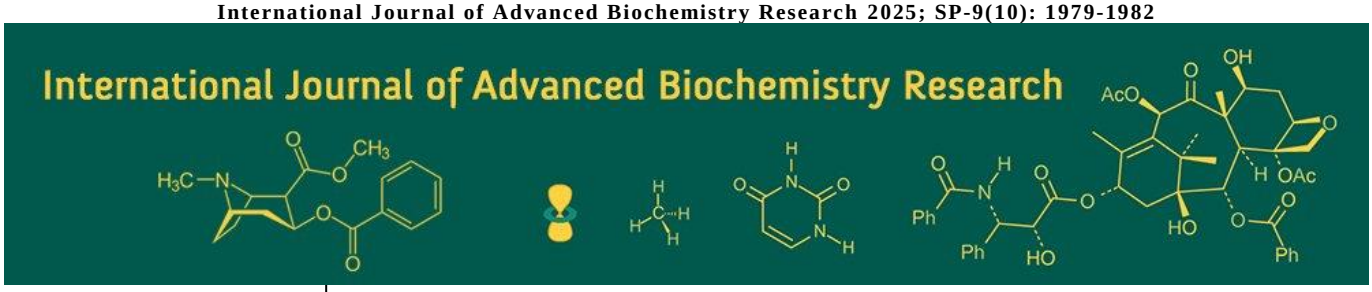

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To study the effect of different substrates on spawn run and first harvest of oyster mushroom (*Pleurotus sajor-caju*)

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Abstract
This study was conducted to evaluate the influence of different substrates on the number of days required for spawn run and first harvest of oyster mushroom (*Pleurotus sajor-caju*). Twelve treatments were tested, including single substrates (wheat straw, paddy straw, soybean straw, banana straw, cotton straw, maize straw) and their combinations with soybean straw, along with a mixed treatment of all substrates in equal proportions. Significant differences were recorded among treatments. Soybean straw supported the fastest spawn run (15.5 days) and earliest first harvest (23 days), followed by wheat straw (17.5 and 24 days, respectively) and paddy straw (18 and 25 days, respectively). Banana straw required the longest duration for both parameters (21 days spawn run; 29.5 days first harvest). The results suggest that soybean straw is the most suitable substrate for rapid crop establishment and early production, which can enhance profitability in commercial mushroom farming.

Keywords: *Pleurotus sajor-caju*, spawn run, first harvest, substrate selection, soybean straw, mushroom cultivation.

1. Introduction
Mushroom cultivation is an important agro-based enterprise that converts low-value agricultural wastes into high-value food (Chang and Miles, 2004) [3]. Among the edible mushrooms, oyster mushrooms (*Pleurotus* spp.) occupy a prominent position due to their high nutritional quality, medicinal properties, and adaptability to a wide range of climatic conditions (Patil, 2012) [7]. They are a rich source of proteins, vitamins, minerals, and dietary fiber, while being low in fat and calories, making them suitable for health-conscious consumers (Banik and Nandi, 2004) [2].

Pleurotus sajor-caju, commonly known as the grey oyster mushroom, is widely cultivated in tropical and subtropical regions. It is preferred by growers because of its ability to grow on a variety of lignocellulosic residues, such as wheat straw, paddy straw, soybean straw, banana pseudo-stem, cotton stalks, and maize stalks (Ahmed *et al*., 2009; Pala *et al*., 2012) [1, 5]. The choice of substrate plays a critical role in mushroom production because it directly affects spawn run duration, pinhead initiation, first harvest, yield, and biological efficiency (Survase, 2012; Telang *et al*., 2010) [8, 9].

The spawn run period the time taken for mycelium to fully colonize the substrate is a key factor in mushroom cultivation. Faster colonization not only shortens the total cropping period but also reduces contamination risks (Patel *et al*., 2019) [6]. Similarly, the time to first harvest determines how quickly the grower can generate income and start the next crop cycle. Substrates rich in nutrients, particularly nitrogen, have been reported to promote faster mycelial growth and early fruiting (Deshmukh and Deshmukh, 2013) [4].

Previous studies have shown variability in spawn run duration and first harvest time depending on the substrate. For instance, Survase (2012) found that soybean straw and wheat straw supported shorter spawn runs than cotton and banana straw. Pala *et al*. (2012) [5] reported that paddy straw allowed faster pinhead formation compared to other substrates. However, there is limited research directly comparing a wide range of single substrates and their combinations for *P. sajor-caju* under uniform cultivation conditions.

Therefore, the present study was undertaken to evaluate the effect of different substrates both single and in combination on the number of days required for spawn run and first harvest of *Pleurotus sajor-caju*. The findings aim to help growers select the most suitable substrate for faster crop cycles and improved profitability.

2. Materials and Methods

Experimental site and design

The experiment was carried out at Mushroom cultivation unit, College of Agriculture, Badnapur. Under controlled environmental conditions during [November 2024 to February 2025]. The study used a Completely Randomized Design (CRD) with twelve treatments and two replications for each treatment.

Substrate Treatments

Sr. No.	Tr. No.	Treatments
1	T_1	Wheat straw
2	T_2	Paddy straw
3	T_3	Soybean straw
4	T_4	Banana straw
5	T_5	Cotton straw
6	T_6	Maize straw
7	T_7	Wheat straw + Soybean straw (1:1)
8	T_8	Paddy straw + Soybean straw (1:1)
9	T_9	Banana straw + Soybean straw (1:1)
10	T_{10}	Cotton straw + Soybean straw (1:1)
11	T_{11}	Maize straw + Soybean straw (1:1)
12	T_{12}	Wheat straw + Paddy straw + Soybean straw + Banana straw + Cotton straw + Maize straw (1:1:1: 1:1:1)

Methodology

Spawn preparation: Wheat grains were cleaned, soaked, boiled for 30 minutes, and mixed with 4% calcium carbonate to prevent clumping. The grains were sterilized at 121°C for 30 minutes, inoculated with pure culture in aseptic conditions, and incubated at 20-25 °C until full colonization.

Substrate sterilization: Straws were cut into 3-5 cm pieces and sterilized either by autoclaving (20 min at 20 psi) or by chemical treatment using carbendazim and formaldehyde. Excess moisture was removed to maintain 60-70% water content.

Bag filling and spawning: Sterilized polythene bags (45 × 30 cm) were layered with prepared spawn using the ring method (100-120 g spawn per bag). The bags were tied, perforated, and incubated at 20-25°C with 80-85% relative humidity until complete mycelial run.

Cropping and harvesting: After spawn run, bags were slit open for pinhead initiation, usually within 3-4 days. Beds were watered twice daily and ventilated 2-3 hours to maintain optimum humidity and CO_2 balance. Mushrooms matured within 2-3 days of pinning and were harvested by twisting at the base. Three flushes were obtained over 35-40 days, with yield recorded for each flush.

3. Results and Discussion

3.1 Spawn run duration

The time taken for the white mushroom threads (mycelium) to fully spread through the bag of straw was different for each type of substrate (Table 1). The fastest was on soybean straw, taking only 15.5 days. The next fastest were wheat straw (17.5 days) and paddy straw (18.0 days). The slowest was banana straw, which took 21 days, followed closely by cotton straw at 20.5 days.

Soybean straw worked best because it has more nutrients, especially nitrogen, which mushrooms need to grow quickly (Patil, 2012) [7]. It is also softer than most other straws, so the mushroom can easily break it down and spread. Wheat and paddy straw also gave good results because they allow air to pass through easily and keep the right amount of moisture, which is important for the mushroom to grow well (Telang *et al*., 2010) [9].

On the other hand, banana and cotton straw took more time. This may be because they have harder fibers and less nutrition, which slows down mushroom growth (Banik & Nandi, 2004) [2]. Mixing soybean straw with other weaker straws did help speed up the process, but not as much as using soybean straw alone.

Table 1: Effect of different substrates on spawn run of *Pleurotus sajor-caju*

Sr. No.	Treatments	R_1*(days)	R_2*(days)	Mean*(days)
1	Wheat straw	17 (4.12)	18 (4.24)	17.5 (4.18)
2	Paddy straw	18 (4.24)	18 (4.24)	18 (4.24)
3	Soybean straw	15 (3.87)	16 (4)	15.5 (3.93)
4	Banana straw	21 (4.58)	21 (4.58)	21 (4.58)
5	Cotton straw	21 (4.58)	20 (4.47)	20.5 (4.52)
6	Maize straw	19 (4.35)	20 (4.47)	19.5 (4.41)
7	Wheat straw + Soybean straw (1:1)	19 (4.35)	18 (4.24)	18.5 (4.30)
8	Paddy straw + Soybean straw (1:1)	19 (4.35)	18 (4.24)	18.5 (4.30)
9	Banana straw + Soybean straw (1:1)	20 (4.47)	21 (4.58)	20.5 (4.52)
10	Cotton straw + Soybean straw (1:1)	21 (4.58)	19 (4.35)	20 (4.47)
11	Maize straw + Soybean straw (1:1)	19 (4.35)	19 (4.35)	19 (4.35)
12	Wheat straw + Paddy straw + Soybean straw + Banana straw + Cotton straw + Maize straw (1:1:1: 1:1:1)	20 (4.47)	20 (4.47)	20 (4.47)
	S.E.±			0.054
	C.D.(P=0.01)			0.16
	C.V			1.69

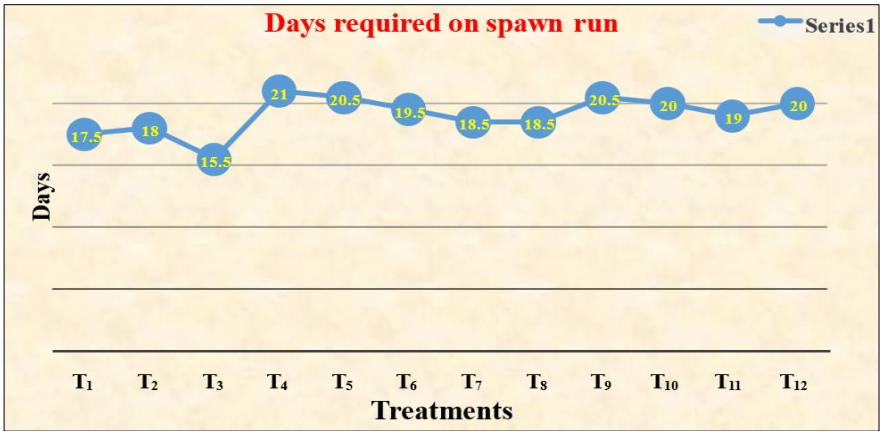

Fig 1: Days required on spawn run

3.2 First harvest

The number of days from spawning to picking the first mushrooms also changed with the type of straw (Table 2). The earliest harvest came from soybean straw in 23 days. Wheat straw was next with 24 days, and paddy straw took 25 days. The longest wait was for banana straw, which took almost 30 days.

The quicker harvest on soybean straw is likely because the mushrooms started forming earlier after colonization, thanks to the better nutrition it provides (Ahmed *et al*., 2009) [1]. Banana and cotton straw delayed harvest because they did not allow the mushrooms to grow as quickly, possibly due to their tough structure and lower nutrient levels (Pala *et al*., 2012) [5].

Substrates mixed with soybean straw were faster than the weaker straws alone, but still slower than pure soybean straw. This shows that while adding soybean straw improves growth, the base straw type still matters for how fast mushrooms are ready to harvest.

Table 2: Effect of different substrates on first harvest of *Pleurotus sajor-caju*.

Sr. No.	Treatments	R_1*(days)	R_2*(days)	Mean*(days)
1	Wheat straw	24 (4.89)	24 (4.89)	24 (4.89)
2	Paddy straw	25 (5)	25 (5)	25 (5)
3	Soybean straw	23 (4.79)	23 (4.79)	23 (4.79)
4	Banana straw	30 (5.47)	29 (5.38)	29.5 (5.43)
5	Cotton straw	28 (5.29)	28 (5.29)	28 (5.29)
6	Maize straw	27 (5.19)	26 (5.19)	26.5 (5.19)
7	Wheat straw + Soybean straw (1:1)	26 (5.09)	26 (5.09)	26 (5.09)
8	Paddy straw + Soybean straw (1:1)	26 (5.09)	27 (5.09)	26.5 (5.14)
9	Banana straw + Soybean straw (1:1)	29 (5.38)	29 (5.38)	29 (5.38)
10	Cotton straw + Soybean straw (1:1)	28 (5.29)	28 (5.29)	28 (5.29)
11	Maize straw + Soybean straw (1:1)	28 (5.29)	27 (5.19)	27.5 (5.24)
12	Wheat straw + Paddy straw + Soybean straw + Banana straw + Cotton straw + Maize straw (1:1:1: 1:1:1)	28 (5.29)	28 (5.29)	28 (5.29)
	S.E.±			0.02
	C.D.(P=0.01)			0.08
	C.V			0.72

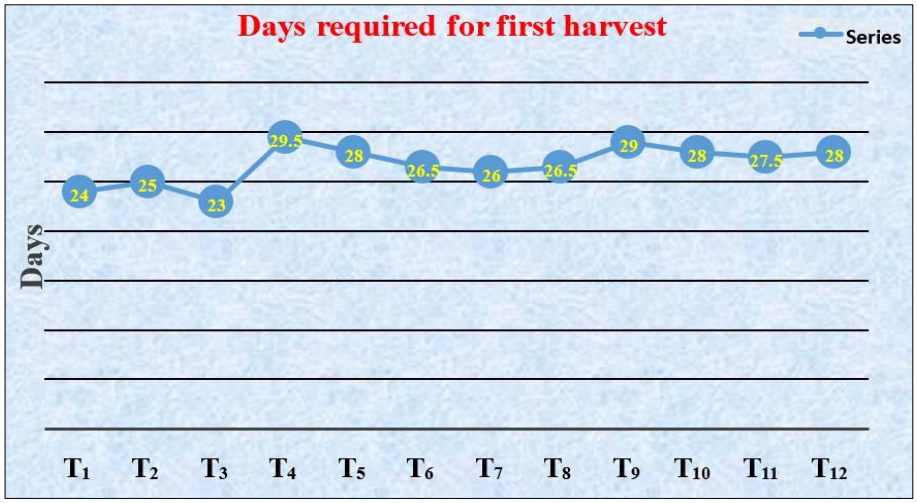

Fig 1: Days required for first harvest

4. Conclusion

This study showed that the type of straw used for growing *Pleurotus sajor-caju* makes a big difference in how fast the mushrooms grow. Soybean straw was the most effective substrate for achieving rapid spawn run (15.5 days) and earliest first harvest (23 days).Wheat and paddy straw also performed well, while banana and cotton straw delayed both growth stages. Combining soybean straw with less favourable substrates improved performance compared to those substrates alone, but did not surpass pure soybean straw.

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