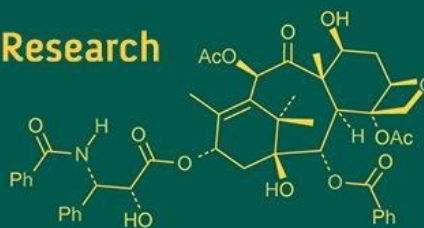


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Akash Singh
Assistant Professor, Shri
Ramswaroop Memorial
University, Barabanki, Uttar
Pradesh, India

Siddarth Nanadan Rahul
Assistant Professor,
Department of Plant
Pathology, Acharya Narendra
Deva University of Agriculture
and Technology, Kumarganj,
Ayodhya, Uttar Pradesh, India

Sushil Kumar Singh
Professor & Head, Department
of Plant Pathology, Acharya
Narendra Deva University of
Agriculture and Technology,
Kumarganj, Ayodhya, Uttar
Pradesh, India

Shweta Patel
Assistant Professor,
Department of Plant
Pathology, Acharya Narendra
Deva University of Agriculture
and Technology, Kumarganj,
Ayodhya, Uttar Pradesh, India

Jitendra Kumar
Ph.D. Research Scholar,
Department of Plant
Pathology, Acharya Narendra
Deva University of Agriculture
and Technology, Kumarganj,
Ayodhya, Uttar Pradesh, India

Corresponding Author:
Siddarth Nanadan Rahul
Assistant Professor,
Department of Plant
Pathology, Acharya Narendra
Deva University of Agriculture
and Technology, Kumarganj,
Ayodhya, Uttar Pradesh, India

Evaluation of Substrate Impact on *Pleurotus Ostreatus* Growth

Akash Singh, Siddarth Nanadan Rahul, Sushil Kumar Singh, Shweta Patel and Jitendra Kumar

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Abstract

Present studies conducted at Acharya Narendra Deva University of Agriculture & Technology (26.47° N, longitude 82.12° E, and altitude 113 m above sea level) in India during Kharif 2021 and 2022 evaluated various substrates' impact on *Pleurotus ostreatus* growth. Results showed superior growth in T₈ for pileus length, weight, and fruiting bodies. Paddy straw notably influenced stipe growth in *P. florida*. Spawn run duration ranged from 32.75 to 38.87 days, with cropping periods spanning 15.87 to 31.62 days. Oyster mushrooms were harvested 3-5 days after first sighting. Harvesting durations varied among treatments.

Keywords: *Pleurotus ostreatus*, oyster mushroom cultivation, substrate evaluation

Introduction

Mushrooms are a vital part of the human diet, with over 2000 edible species. Some mushrooms are toxic, but commercially grown varieties, like the Oyster mushroom, are popular. Flank, a German, pioneered the cultivation of oyster mushrooms in 1917. These mushrooms, known for thriving on decomposing wood, are easy to grow (Staments, 2000) [18]. Wild edible mushrooms like *Pleurotus*, grown worldwide, have a sweet taste, anise aroma, tender flesh, mild flavor, and velvety texture (Sande *et al.*, 2019) [16]. *Pleurotus*, a fungus genus, thrives in temperate and tropical forests across the Northern Hemisphere, including North America, Europe, Eastern Asia, the Middle East, Mexico, and the Southern Hemisphere (Tura *et al.*, 2016) [19]. Around 1.5 million fungi species worldwide thrive in diverse environments interacting with other organisms through various relationships. Fungi rely on external sources for carbon, nutrients, and energy (Philippoussis *et al.*, 2001; Perotto *et al.*, 2013; Vajna *et al.*, 2019) [15, 14, 20]. Fungi decompose dead matter, converting carbon and nutrients into plant-friendly forms (Brundrett, 2004) [2].

Fungi play a vital role in ecosystems. Research aims to reduce disease harm in oyster mushroom cultivation, while utilizing their nutritional benefits for health. Oyster mushrooms are rich in vitamins and folic acid, aiding in malnutrition treatment (Wrzosek *et al.*, 2017; Zervakis *et al.*, 2018) [21, 22]. They can quiet muscles, stop vessel leaks, strengthen veins, and calm tendons, aiding weight loss (Chang and Miles, 2004; Chai *et al.*, 2021) [4, 3]. Oyster mushrooms, particularly *Pleurotus ostreatus*, have been extensively studied for their hepatoprotective properties during the past 20 years (Fernandez-Fueyo *et al.*, 2016) [5]. Studies show that a 5% *Pleurotus ostreatus* supplement reduces Wister rats' cholesterol and boosts antioxidant enzymes in the liver, hinting at oyster mushrooms' potential health benefits (Kang *et al.*, 2017; Kertesz, and Thai, 2018) [6, 7]. Consuming *Pleurotus ostreatus* may reduce cholesterol by inhibiting enzyme activity, enhancing bile production, catabolizing cholesterol, and increasing excretion through faeces (Kurt *et al.*, 2010; Kurtzman, 2010) [8, 9].

In this scenario, antioxidants like reduced glutathione aid bile flow disrupted by oxidative stress from hypercholesterolemia. Oyster mushrooms lower cholesterol by reducing absorption, synthesis and enhancing elimination, offering health benefits by controlling lipids, glucose, and antioxidants (Lindahl and Tunlid, 2015; Li and Shah, 2016) [11, 10]. The oyster mushroom, known as Dhingri in India, scientifically named *Pleurotus* sp., was described in 1975 by Dutch naturalist Nikolaus Joseph Freiherr von Jacquin.

Oyster mushrooms have various stalk types and are rich in essential nutrients. They can be grown using agricultural residues, effectively recycling waste into food (Philippoussis *et al.*, 2001) [15]. Mushrooms are a high-protein, tasty food. Over the last ten years, their output in the United States has steadily increased (Olivieri *et al.*, 2006) [13]. Oyster mushrooms are successfully farmed and considered a delicacy, with researchers studying their cultivation on different lignocellulos materials (Bisaria *et al.*, 1987; Zhang *et al.*, 2002; Satpal *et al.*, 2017) [1, 23, 17]. The mushrooms had a protein content of 26.3-36.7%. Detailed analysis of straw composition during mushroom growth is lacking. Previous research suggests *P. major-cajun* might fix nitrogen (Muswati *et al.*, 2021) [12]. Oyster mushrooms are highly nutritious and possess medicinal properties due to bioactive compounds. They offer various health benefits, including ant diabetic, antioxidant, and anticancer effects. Growing oyster mushrooms involves spawn and substrate preparation, with different materials used to enhance productivity sustainably (Mandeel *et al.*, 2005; Muswati *et al.*, 2021) [12]. Cultivating this mushroom can transform agricultural wastes into nutritious products, aiding sustainable agriculture. *Pleurotus ostreatus* is rich in bioactive compounds, showing potential for medicinal benefits (Sande *et al.*, 2019) [16]. Current study aims to optimize *Pleurotus ostreatus* cultivation by exploring various factors such as substrates, nitrogen sources, and bioactive compounds, crucial for enhancing its growth and utility in food, biotechnology, and medicine.

Materials and Methods

The research experiment of the evaluation of substrates on *Pleurotus ostreatus* growth was conducted at Mushroom Lab, Department of Plant Pathology, Acharya Narendra Deva University of Agriculture and Technology, India in 2021-22 and 2022-23. Details of materials, techniques, and procedures were followed. Ayodhya, in Eastern Uttar Pradesh, has a sub-tropical climate with latitude of 26.47° N, longitude of 82.12° E, and altitude of 113 m above sea level. Kumarganj receives around 1000.37 mm annual precipitation. Summers are hot from April to mid-July with occasional showers. Data on temperature, humidity, rainfall, sunshine, and wind speed were collected from the meteorological observatory at university campus during mushroom cropping.

Results and Discussion

A 70-100 gauge polythene bag (35 cm x 45 cm) was used for cultivating mushrooms. Each bag was filled with 1 kg of dry straw from various substrates. Pasteurization was done using autoclaving with 1.5 kg vapor pressure or 15 lbs/sq inch for 15-20 minutes. Spawn was added at 2% of wet straw, taking 20 days to complete the spawn run at 24±2 °C. Pinheads appeared within 3 days of opening bags, ready for harvest in 2-3 days. After harvesting, beds were kept at 24 +2 °C with over 85% humidity. Second and third crops were harvested after 7-10 days each. Observations on mushroom aspects were noted in different treatments.

Pileus diameter

The combined data from Rabi's studies in 2021-22 and 2022-23 showed significant variations in pileus diameter of *P. ostreatus* across different substrates (Table 1, 2 & 3). T₈ had the largest pileus diameter in the 1st, 2nd, and 3rd picks

(8.275 cm, 8.278 cm, 8.547 cm), followed by T₅, T₇, T₁, T₉, T₂, T₄, T₃, and the smallest in T₆ (5.88 cm, 5.91 cm, 6.17 cm). Similarly, Tesfay *et al* (2020) found that the best results were with a mix of 50% cornstalk and 25% wheat bran added to waste paper, leading to the highest weight, pileus diameter, yield, and BE. Conversely, using only waste paper resulted in the lowest BE.

Table 1: Effect of Different substrate on Pileus diameter (cm) of *Pleurotus ostreatus* at the time of first harvesting

Treatments	Pileus diameter		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	7.50	7.12	7.31
T ₂ (WP 60% + WS 40%)	6.85	6.68	6.76
T ₃ (WP 70% + WS 30%)	6.33	6.09	6.21
T ₄ (WP 80% + WS 20%)	6.53	6.39	6.46
T ₅ (SB 30% + WS 70%)	8.07	8.04	8.05
T ₆ (VW 30% + WS 70%)	6.16	5.62	5.89
T ₇ (WD 30% + WS 70%)	7.81	7.58	7.70
T ₈ (SB30%+WS70%+5% Caffeine)	8.09	8.46	8.28
T ₉ (WS 100%)	7.48	6.87	7.18
C.D. at 1%	0.95	1.04	0.99
SE(m)	0.32	0.35	0.34
C.V.	8.98	10.09	9.54

Table 2: Effect of different substrate on Pileus diameter (cm) of *Pleurotus ostreatus* at the time of second harvesting

Treatments	Pileus diameter		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	7.18	7.37	7.28
T ₂ (WP 60% + WS 40%)	6.76	6.73	6.74
T ₃ (WP 70% + WS 30%)	6.28	6.39	6.33
T ₄ (WP 80% + WS 20%)	6.32	6.50	6.41
T ₅ (SB 30% + WS 70%)	7.72	8.11	7.91
T ₆ (VW 30% + WS 70%)	5.88	5.95	5.91
T ₇ (WD 30% + WS 70%)	7.39	7.51	7.45
T ₈ (SB30%+WS70%+5% Caffeine)	8.18	8.38	8.28
T ₉ (WS 100%)	7.17	7.32	7.24
C.D. at 1%	0.93	1.05	0.99
SE(m)	0.32	0.36	0.34
C.V.	9.08	10.06	9.57

Table 3: Effect of different substrate on Pileus diameter (cm) of *Pleurotus ostreatus* at the time of third harvesting

Treatments	Pileus diameter		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	7.35	7.36	7.35
T ₂ (WP 60% + WS 40%)	7.13	7.18	7.15
T ₃ (WP 70% + WS 30%)	6.78	6.43	6.61
T ₄ (WP 80% + WS 20%)	7.06	6.57	6.82
T ₅ (SB 30% + WS 70%)	7.91	8.14	8.02
T ₆ (VW 30% + WS 70%)	6.24	6.11	6.18
T ₇ (WD 30% + WS 70%)	7.68	7.74	7.71
T ₈ (SB30%+WS70%+5% Caffeine)	8.49	8.61	8.55
T ₉ (WS 100%)	7.29	7.28	7.28
C.D. at 1%	1.15	1.48	1.32
SE(m)	0.39	0.51	0.45
C.V.	10.70	13.89	12.30

Pileus length

The pooled data in tables (4, 5, & 6) clearly show that *P. ostreatus* had the longest pileus length in T₈ (6.51 cm, 7.14 cm, and 6.70 cm) after 1st, 2nd, and 3rd harvesting, superior to other treatments like T₅, T₇, T₁, T₉, T₂, T₄, and T₃, with the shortest length seen in T₆ (4.81 cm, 4.43 cm, and 4.68 cm). Similarly, Shukla 2011 studied, *P. florida* exhibited a

maximum pileus length of 6.71 cm, a trait passed down to its hybrids like *P. sarjo caju* (6.42 cm) and *H. ulmarius* (5.36 cm).

Table 4: Effect of different substrate on Pileus Length (cm) of *Pleurotus ostreatus* at the time of first harvesting

Treatments	Pileus length		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	5.88	5.84	5.86
T ₂ (WP 60% + WS 40%)	5.23	5.42	5.33
T ₃ (WP 70% + WS 30%)	4.92	4.92	4.92
T ₄ (WP 80% + WS 20%)	5.16	5.14	5.15
T ₅ (SB 30% + WS 70%)	6.14	6.21	6.17
T ₆ (VW 30% + WS 70%)	4.77	4.87	4.82
T ₇ (WD 30% + WS 70%)	6.03	5.92	5.98
T ₈ (SB30%+WS70%+5%Caffeine)	6.43	6.60	6.51
T ₉ (WS 100%)	5.66	5.73	5.70
C.D. at 1%	0.97	1.08	1.03
SE(m)	0.33	0.37	0.35
C.V.	11.82	13.12	12.47

Table 5: Effect of different substrate on Pileus Length (cm) of *Pleurotus ostreatus* at the time of second harvesting

Treatments	Pileus length		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	6.14	6.10	6.12
T ₂ (WP 60% + WS 40%)	5.76	5.69	5.73
T ₃ (WP 70% + WS 30%)	5.38	5.45	5.41
T ₄ (WP 80% + WS 20%)	5.48	5.51	5.49
T ₅ (SB 30% + WS 70%)	6.68	6.80	6.74
T ₆ (VW 30% + WS 70%)	4.59	4.29	4.44
T ₇ (WD 30% + WS 70%)	6.31	6.22	6.26
T ₈ (SB30%+WS70%+5%Caffeine)	7.15	7.14	7.15
T ₉ (WS 100%)	6.09	6.06	6.08
C.D. at 1%	0.91	0.97	0.94
SE(m)	0.31	0.33	0.32
C.V.	10.38	11.13	10.76

Table 6: Effect of different substrate on Pileus Length (cm) of *Pleurotus ostreatus* at the time of third harvesting

Treatments	Pileus length		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	5.95	6.06	6.00
T ₂ (WP 60% + WS 40%)	5.67	5.80	5.74
T ₃ (WP 70% + WS 30%)	5.15	4.94	5.05
T ₄ (WP 80% + WS 20%)	5.21	5.13	5.17
T ₅ (SB 30% + WS 70%)	6.29	6.33	6.31
T ₆ (VW 30% + WS 70%)	4.76	4.61	4.68
T ₇ (WD 30% + WS 70%)	5.99	6.10	6.04
T ₈ (SB30%+WS70%+5%Caffeine)	6.42	6.98	6.70
T ₉ (WS 100%)	5.89	5.86	5.87
C.D. at 1%	0.77	0.88	0.82
SE(m)	0.26	0.30	0.28
C.V.	9.21	10.39	9.80

Pileus weight

Table 7, 8 & 9 revealed that the heaviest pileus weights for *P. ostreatus* were in T₈ (442.37 gm, 423.5 gm, 427.62 gm), then T₅ (413.37 gm, 408.25 gm, 416.12 gm), T₇ (400.62 gm, 399.25 gm, 394.50 gm), T₁ (382.87 gm, 383.75 gm, 370.37 gm), T₉ (373.25 gm, 365.87 gm, 363.37 gm), T₂ (365.12 gm, 354.75 gm, 340.12 gm), T₄ (354. gm, 350.12 gm, 306.62 gm), T₃ (331.62 gm, 339.8 gm, 323 gm) after 1st, 2nd, and 3rd picking.

Similarly, in a study by Bulti Kumera Fufa (2021), finger millet straw substrate had the highest pinheads and fruiting

bodies, averaging 29.60 and 11.44, respectively. Conversely, a mixture of corncob and bamboo waste (50% each) resulted in the lowest biological efficiency (20.80 ± 0.41), fresh weight (101.48 ± 0.91), pinheads (14.40), and fruiting bodies (4.25).

Table 7: Effect of different substrate on Pileus weight (gm) of *Pleurotus ostreatus* at a time of first harvesting

Treatments	Pileus weight		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	389.00	376.75	382.88
T ₂ (WP 60% + WS 40%)	373.00	357.25	365.13
T ₃ (WP 70% + WS 30%)	343.75	319.50	331.63
T ₄ (WP 80% + WS 20%)	359.00	349.00	354.00
T ₅ (SB 30% + WS 70%)	408.25	418.50	413.38
T ₆ (VW 30% + WS 70%)	320.25	318.75	319.50
T ₇ (WD 30% + WS 70%)	398.50	402.75	400.63
T ₈ (SB30%+WS70%+5%Caffeine)	445.00	439.75	442.38
T ₉ (WS 100%)	378.00	368.50	373.25
C.D. at 1%	43.91	52.93	48.42
SE(m)	14.95	18.03	16.49
C.V.	7.88	9.90	8.89

Table 8: Effect of different substrate on Pileus weight (gm) of *Pleurotus ostreatus* at a time of second harvesting

Treatments	Pileus weight		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	381.50	386.00	383.75
T ₂ (WP 60% + WS 40%)	348.25	361.25	354.75
T ₃ (WP 70% + WS 30%)	351.25	349.00	350.13
T ₄ (WP 80% + WS 20%)	321.00	358.75	339.88
T ₅ (SB 30% + WS 70%)	404.75	411.75	408.25
T ₆ (VW 30% + WS 70%)	295.75	311.00	303.38
T ₇ (WD 30% + WS 70%)	388.75	409.75	399.25
T ₈ (SB30%+WS70%+5%Caffeine)	418.25	428.75	423.50
T ₉ (WS 100%)	364.00	367.75	365.88
C.D. at 1%	54.46	44.42	49.44
SE(m)	18.55	15.13	16.84
C.V.	10.20	8.05	9.12

Table 9: Effect of different substrate on Pileus weight (gm) of *Pleurotus ostreatus* at a time of third harvesting

Treatments	Pileus weight		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	380.00	360.75	370.38
T ₂ (WP 60% + WS 40%)	339.75	340.50	340.13
T ₃ (WP 70% + WS 30%)	290.25	323.00	306.63
T ₄ (WP 80% + WS 20%)	297.00	332.00	314.50
T ₅ (SB 30% + WS 70%)	403.50	428.75	416.13
T ₆ (VW 30% + WS 70%)	293.75	289.25	291.50
T ₇ (WD 30% + WS 70%)	385.75	403.25	394.50
T ₈ (SB30%+WS70%+5%Caffeine)	413.25	442.00	427.63
T ₉ (WS 100%)	379.50	347.25	363.38
C.D. at 1%	56.98	73.48	65.23
SE(m)	19.41	25.03	22.22
C.V.	10.97	13.79	12.38

Number of fruiting body

The fruiting bodies were most abundant in T₈, followed by T₅, T₇, T₁, T₉, T₂, T₄, T₃, and T₆ in both years, showing a consistent pattern. *P. florida* exhibited enhanced stipe weight, with paddy straw notably fostering robust growth. Similarly, substrate variations influenced *Pleurotus* stipe weight, with *P. florida* excelling on paddy straw, indicating a strong growth correlation. Notably, *P. florida* displayed the largest pileus size among *Pleurotus* species, with paddy

straw playing a pivotal role. Overall, substrates impact the weight of fruiting bodies, where *P. florida* thrives, particularly with paddy straw. Gundersen (2021) corroborated these significant findings. Different *Pleurotus* species varied in fruiting body production influenced by different straws. *P. sajor-caju* had the highest yield, followed by *P. ostreatus* and *P. florida*. Soyabean straw showed the best results, followed by soyabean + paddy straw. In a study by Chavan *et al* (2003), *P. sajor-caju* was cultivated using various agrowastes. With soyabean straw yielding 935.25 gm and paddy yielding 816.00 gm, T₆ had the lowest pileus weight (319.5 gm, 303.75 gm, 291.5 gm). Substrates affected *Pleurotus* fruiting body weights; *P. florida*'s weight exceeded others. Paddy straw bed resulted in the heaviest fruiting body weight (Table.10).

Table 10: Effect of different substrate on Number of Fruiting Bodies of *Pleurotus ostreatus*

TREATMENTS	Number of fruiting bodies		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	12.75	12.00	12.38
T ₂ (WP 60% + WS 40%)	12.00	9.50	10.75
T ₃ (WP 70% + WS 30%)	9.25	9.25	9.25
T ₄ (WP 80% + WS 20%)	9.50	10.00	9.75
T ₅ (SB 30% + WS 70%)	13.50	14.00	13.75
T ₆ (VW 30% + WS 70%)	8.75	9.00	8.88
T ₇ (WD 30% + WS 70%)	14.00	12.25	13.13
T ₈ (SB30%+WS70%+5%Caffeine)	13.25	14.25	13.75
T ₉ (WS 100%)	12.00	12.50	12.25
C.D. at 1%	3.37	3.66	3.52
SE(m)	1.15	1.25	1.20
C.V.	19.68	21.85	20.76

Days of spawn run

The data in table 11 shows that spawn run days varied across treatments, with T₉ having the longest (38.87) and T₆ the shortest (31.25) (Pathmashini, 2008). Kurakkan spawn outperformed maize, sorghum, and paddy in spawn running, pinhead and fruit body formation, and overall yield. Kurakkan spawn excelled with a spawn run of 21±1 days and pinhead formation in 35±1 days, yielding 55.37±0.67 g with 30.76% fresh mushroom yield.

Table 11: Effect of different substrate on Days for Spawn of *Pleurotus ostreatus*

Treatments	Number for spawn run		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	36.00	36.25	36.13
T ₂ (WP 60% + WS 40%)	34.50	33.25	33.88
T ₃ (WP 70% + WS 30%)	34.25	31.25	32.75
T ₄ (WP 80% + WS 20%)	33.50	34.25	33.87
T ₅ (SB 30% + WS 70%)	38.25	38.75	38.50
T ₆ (VW 30% + WS 70%)	30.75	31.75	31.25
T ₇ (WD 30% + WS 70%)	37.00	37.25	37.13
T ₈ (SB30%+WS70%+5%Caffeine)	40.50	37.25	38.88
T ₉ (WS 100%)	34.75	33.75	34.25
C.D. at 1%	3.21	3.13	3.17
SE(m)	1.09	1.07	1.08
C.V.	6.17	6.12	6.14

Days of cropping period

Table 12 discovered that in 2021-22 and 2022-23, T₈ had the longest cropping period (31.62 days), followed by T₅ (30.75), T₇ (30.62), T₁ (27), T₉ (23.25), T₂ (21.87), T₄ (20.75), and T₃ (17.25), with the shortest in T₆ (15.87).

Similarly, in the study by Girmay (2016), cotton seed and paper waste achieved faster mycelial growth in 14 days, whereas wheat straw took 15.67 days and sawdust 19.67 days. Pin-head formation varied: cotton seed was fastest at 17 days, sawdust at 29 days, and wheat straw slowest at 32.66 days

Table 12: Effect of different substrate on Number of Cropping Period of *Pleurotus ostreatus*

Treatments	Number of cropping period		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	26.50	27.50	27.00
T ₂ (WP 60% + WS 40%)	20.75	23.00	21.88
T ₃ (WP 70% + WS 30%)	16.75	17.75	17.25
T ₄ (WP 80% + WS 20%)	19.50	22.00	20.75
T ₅ (SB 30% + WS 70%)	30.00	31.50	30.75
T ₆ (VW 30% + WS 70%)	15.25	16.50	15.88
T ₇ (WD 30% + WS 70%)	30.00	31.25	30.63
T ₈ (SB30%+WS70%+5%Caffeine)	31.25	32.00	31.63
T ₉ (WS 100%)	22.50	24.00	23.25
C.D. at 1%	2.80	2.63	2.72
SE(m)	0.95	0.90	0.93
C.V.	8.07	7.16	7.62

Days of first harvesting

Oyster mushrooms harvesting typically starts three to five days after the first mushrooms are seen. Analysis of pooled data in table 13 across two years showed T₈ (39.0 days) as the quickest for first harvesting, followed by T₅ (40.5), T₇ (42.37), T₁ (42.38), T₉ (45.75), T₂ (47.75), T₄ (48.12), and T₃ (52.12). The longest period for first harvesting was in T₆ (54.75 days), according to Sharma (2013). Substrate colonization ranged from 22.40 to 26.00 days, while primordia appeared between 26.40 and 31.60 days. First mushroom harvest occurred between 32 and 37 days, with the shortest times noted with rice straw: colonization (22.40 days), primordial formation (26.40 days), and first harvest (32.40 days).

Table 13: Effect of different substrate on Number at the time of first harvesting of *Pleurotus ostreatus*

Treatments	Number of days first harvested		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	45.00	46.50	45.75
T ₂ (WP 60% + WS 40%)	47.25	49.00	48.13
T ₃ (WP 70% + WS 30%)	52.00	52.25	52.13
T ₄ (WP 80% + WS 20%)	50.75	51.25	51.00
T ₅ (SB 30% + WS 70%)	40.25	40.75	40.50
T ₆ (VW 30% + WS 70%)	54.50	55.00	54.75
T ₇ (WD 30% + WS 70%)	42.00	42.75	42.38
T ₈ (SB30%+WS70%+5%Caffeine)	39.25	38.75	39.00
T ₉ (WS 100%)	47.75	47.75	47.75
C.D. at 1%	2.72	3.17	2.94
SE(m)	0.93	1.08	1.00
C.V.	3.98	4.58	4.28

Number of lobes

It is evident from the table 14 are clearly indicated that highest number of lobes was showed in T₈ (40.25, 34.0 and 21.62) after 1st, 2nd and 3rd harvesting followed by T₅ (29.87, 28.5 and 19.25), T₇ (25.5, 24.75 and 17.25), T₁ (25.0, 24.75 and 17.25), T₉ (23.0, 23.0 and 14.12), T₂ (22.25, 20.75 and 12.87), T₄ (19.5, 19.87 and 12.37), T₃ (18.87, 19.12 and

11.25). The lowest number of lobes was recorded in T₆ (17.5, 13.87 and 10.5).

Table 14: Effect of different substrate on Number of lobes of *Pleurotus ostreatus*

Treatments	Number of lob		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	25.00	25.00	25.00
T ₂ (WP 60% + WS 40%)	22.75	21.75	22.25
T ₃ (WP 70% + WS 30%)	18.25	19.50	18.88
T ₄ (WP 80% + WS 20%)	19.25	19.75	19.50
T ₅ (SB 30% + WS 70%)	29.50	30.25	29.88
T ₆ (VW 30% + WS 70%)	17.75	17.25	17.50
T ₇ (WD 30% + WS 70%)	25.75	25.25	25.50
T ₈ (SB30%+WS70%+5%Caffeine)	39.50	41.00	40.25
T ₉ (WS 100%)	23.25	22.75	23.00
C.D. at 1%	8.33	8.87	8.60
SE(m)	2.84	3.02	2.93
C.V.	23.11	24.45	23.78

Total yield (gm/kg dry substrate)

The highest oyster yield was in T₈ (30% Sugarcane bagasse + 70% Wheat straw with 5% Caffeine) at 45.68, 46.26, and 46.97 gm/kg dry substrate after 1st, 2nd, and 3rd harvests in both years (2021-22 and 2022-23). Following were T₅ (44.09, 43.78, 45.75 gm/kg), T₇ (42.82, 42.68, 43.69 gm/kg), T₁ (41.66, 41.31, 39.81 gm/kg), T₉ (40.74, 39.46, 39.34 gm/kg), T₂ (39.76, 38.57, 36.93 gm/kg), T₄ (39.43, 38.14, 35.44 gm/kg), T₃ (38.37, 36.96, 34.53 gm/kg). The lowest yield was in T₆ at 35.99, 33.61, 32.89 gm/kg (Table. 15). The production of Oyster which agrees with the findings of Martinez-Carrera, (1990) who similarly studied the Oyster mushroom production on sawdust of different woods and found that *Pleurotus ostreatus* gave the highest yield (Montoya *et al.*, 2008) cultivated *P. ostreatus* on different substrates and reported the highest yield on wheat straw, followed by the combination of paddy and wheat straw.

Table 15: Effect of Different substrate on Pileus dry weight (gm) of *Pleurotus ostreatus* at the time of first harvesting

Treatments	Pileus Dry Weight		
	2021-22	2022-23	Pooled
T ₁ (WP 50% + WS 50%)	40.25	43.07	41.66
T ₂ (WP 60% + WS 40%)	38.88	40.66	39.77
T ₃ (WP 70% + WS 30%)	37.77	38.97	38.37
T ₄ (WP 80% + WS 20%)	38.20	40.67	39.44
T ₅ (SB 30% + WS 70%)	42.98	45.21	44.10
T ₆ (VW 30% + WS 70%)	36.22	35.77	35.99
T ₇ (WD 30% + WS 70%)	41.82	43.83	42.83
T ₈ (SB30%+WS70%+5%Caffeine)	45.35	46.02	45.68
T ₉ (WS 100%)	39.90	41.59	40.74
C.D. at 1%	5.21	5.76	5.48
SE(m)	1.77	1.96	1.87
C.V.	8.83	9.40	9.12

Conclusion

The pooled data revealed that in T₈, *P. ostreatus* had the longest pileus length (6.51 cm, 7.14 cm, and 6.70 cm) after each harvesting cycle. T₈ also yielded the highest pileus weight (442.37 gm, 423.5 gm, and 427.62 gm) compared to other treatments. Additionally, T₈ produced the most fruiting bodies (13.75) across both years, with T₅ and T₇ following closely behind. The stipe weight of different *Pleurotus* species has been influenced by different

substrates. The stipe weight of *P. florida* was maximum on different substrates. Among the substrate maximum stipe weight was noticed with paddy straw. The results of the present investigations on stipe growth have clearly indicated that paddy straw helped *P. florida* to show maximum stipe growth. Analysis of pooled data revealed: T₉ had the longest spawn run day at 38.87, followed by T₅, T₇, T₁, T₉, T₂, T₄, and T₃. T₈ had the longest cropping days in 2021-22 and 2022-23 at 31.62, followed by T₅, T₇, T₁, T₉, T₂, T₄, and T₃. T₆ had the shortest cropping period at 15.87. Oyster mushroom harvesting occurs in three to five days after first mushrooms observed. Data from two pooled seasons (2021-22 and 2022-23) show that the shortest time to first harvest was in T₈ (39.0 days), followed by T₅ (40.5), T₇ (42.37), T₁ (42.38), T₉ (45.75), T₂ (47.75), T₄ (48.12), and T₃ (52.12).

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