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Comparative Evaluation of Cultural, Morphological and Nutritional Characterisation of Selected *Pleurotus* Species

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***Abstract*— *The study assessed five Pleurotus species (P. sajor-caju, P. florida, P. djamor, P. citrinopileatus, and P. membranaceous) for mycelial growth, morphological traits, and nutritional composition. Significant interspecific variation was observed across media types, with P. sajor-caju showing the highest yield and biological efficiency, while P. djamor exhibited the fastest colonization and early pinning. Morphological traits varied distinctly among species. Nutritionally, P. sajor-caju had the highest protein and mineral content, while P. membranaceous showed maximum carbohydrate and moisture levels. All species were low in fat, supporting their dietary value. The findings identify P. sajor-caju and P. djamor as promising species for commercial cultivation.*

***Keywords*— Mushroom, Pleurotus, Dhingri and Biological Efficiency.**

I. INTRODUCTION

The word "mushroom" originates from the Gallo-Roman term *mussirio*, referring to macro-fungi with fleshy fruiting bodies. Belonging to the division *Basidiomycota*, mushrooms include saprophytic, mycorrhizal, and parasitic fungi. Their vegetative structure consists of thread-like hyphae (mycelium), which under favourable conditions produce visible fruiting bodies, either above (epigenous) or below (hypogenous) ground (Chang and Miles, 1992).

Pleurotus ostreatus, commonly known as the oyster mushroom or "Dhingri" in India, is a member of the family Agaricaceae under the class Basidiomycetes. It naturally grows on decaying wood in temperate and tropical forests and can also thrive on decomposing organic matter (Senthli, 2017). Oyster mushrooms are widely cultivated due to their simple cultivation methods, high yield, and rich nutritional profile (Chaudhary *et al.,* 2017).

In India, annual mushroom production is approximately 2.69 lakh tonnes, with Bihar (11.3%) being the leading producer, followed by Odisha (10.2%) and Maharashtra (9.3%) (ICAR-DMR, 2023–24). Oyster mushrooms contribute around 16% of total production, ranking second after white button mushrooms (73%), followed by paddy straw (7%) and milky mushrooms (4%). India exported 105.4 tonnes of processed button mushrooms in 2016–17, earning ₹7,282.26 lakh (Sharma *et al*., 2017).

The genus *Pleurotus* derives its name from the Greek "Pleuro," meaning side, indicating the lateral attachment of the stipe. *Pleurotus sajor-caju*, widely cultivated on sterilized wheat or rice straw, accounts for 16–39% of global mushroom output (Pathak *et al*., 2018).

II. METHODOLOGY

This experiment was conducted to evaluate the cultural, morphological characteristics and nutritional analysis of five different *Pleurotus* species and to identify the most vigorous species under varying cultivation conditions. The selected species were cultivated from March to May 2025 for comparative assessment.

Five species will be taken for this investigation as follows:

Sr. No.	Oyster Species	Coded Name
1.	*Pleurotus sajor-caju*	DMRP-115
2.	*Pleurotus florida*	DMRP-136
3.	*Pleurotus citrinopileatus*	DMRP-116
4.	*Pleurotus djamor*	DMRP-205
5.	*Pleurotus membranaceus*	DMRP-392

Studies on cultural characterization of *Pleurotus* species

The mycelial growth patterns of five *Pleurotus* species were studied on two different solid media to determine their suitability for supporting mycelial development. The media were sterilized at 121.6°C under 15 psi pressure for 20 minutes. Subsequently, 20 ml of each medium was poured into 90 mm diameter Petri dishes. These plates were inoculated with 5 mm discs cut from 15-day-old cultures of *Pleurotus* species using a sterilized cork borer and incubated at 25°C.

The experimental design followed a Completely Randomized Design (CRD) with five replications per treatment. Radial mycelial growth was measured by taking the average of two perpendicular diameters of the colony and subtracting the initial 5 mm disc. Data on mycelial growth were statistically analyzed. Observations continued until any one treatment reached full Petri plate coverage.

The preparation of solid media whose composition is given below were taken for *in vitro* studies.

Composition of different media:

S. No.	Medium	Constituents	Quantity
1.	Malt Extract Agar	Malt extract Agar-agar Distilled water pH	20 g 20 g 1000 ml 7.0
2.	Potato Dextrose Agar	Peeled potato Dextrose Agar-agar Distilled water pH	200.00 g 20.00 g 20.00 g 1000 ml 7.0

Preparation of media: The media were prepared following standard protocols. For Potato Dextrose Agar (PDA), 500 ml of water was taken in a 1-litre beaker and 200 g of peeled and sliced potatoes were added. For Malt Extract Agar (MEA), 20 g of malt extract was used in place of potato. The contents were gently boiled for about 20 minutes or until the potatoes could be easily pierced with a glass rod. The extract was then filtered through muslin cloth, squeezing out all the liquid. Then add 20 g dextrose (in the case of PDA only) and 20 g of agar-agar were added to the filtrate. The volume was adjusted to 1000 ml using distilled water. The medium was dispensed into 200 ml portions in conical flasks and sterilized in an autoclave before use.

Studies on morphological characterization of *Pleurotus* species

The morphological characterization of the five *Pleurotus* species were assessed by cultivating them on wheat straw substrate during March to May, 2025. The experiment was laid out in a Completely Randomized Design (CRD) comprising five different species of *Pleurotus* as treatments, each replicated four times using four cultivation bags per replication. Wheat straw served as the cultivation substrate, with each bag containing 2.5 kg of wet substrate. Standard cultivation bags of size 12 x 18 inches were used for mushroom production.

The following observations were recorded during the experiment to evaluate the performance of different *Pleurotus* species: days taken for spawn run completion, days taken for pinhead initiation, and the number of fruiting bodies per bag. Morphological characteristics of fruiting bodies were also assessed, including pileus features such as surface texture, size, shape, colour/pigmentation, and margin type. Stipe characteristics and its mode of attachment were also noted. Additionally, the average weight per fruiting body, detailed fruit body measurements, and total yield were recorded to calculate the Biological Efficiency (BE) of each treatment. The biological efficiency was also calculated by following the formula (Chang, 1981).

$$\text{Biological Efficiency (\%)} = \frac{\text{Fresh fruiting bodies (g)}}{\text{Dry weight of substrate (g)}} \times 100$$

Nutritional analysis of different species of *Pleurotus*

The nutritional composition of five *Pleurotus* species (*Pleurotus sajor-caju*, *Pleurotus florida*, *Pleurotus citrinopileatus*, *Pleurotus djamor* and *Pleurotus membranaceus*) were analyzed to compare key quality parameters of the fruiting bodies cultivated under ambient conditions. The study also aimed to examine the relationship between nutritional content and the basal substrate, wheat straw. The experiment was laid out in a Completely Randomized Design (CRD), consisting of five treatments (species) with four replications each.

The following nutritional parameters were assayed to evaluate the quality of different *Pleurotus* species: total moisture content, total protein content, total carbohydrate content, total fat content, and total mineral content. These analyses provided insights into the nutritional composition and potential dietary value of the cultivated mushrooms.

The methods and protocols to achieve the above ones are as follows:

Moisture content: Moisture percentage was determined by sun-drying the freshly harvested mushroom samples and calculating the difference between their fresh and dry weights using the standard formula:

$$\text{Moisture percent} = \frac{Initial\ weight\ of\ mushroom(g) - Dried\ weight\ of\ mushroom(g)}{\text{Initial weight of mushroom(g)}} \times 100$$

Estimation of Protein: Protein content was estimated using the Biuret method as described by Burtis and Ashwood (2006).

Reagents: Protein Standard; 5 mg/ml of purified protein (e.g., BSA or Casein), Biuret Reagent; Prepared by dissolving 3 g $CuSO_4$ and 9 g sodium potassium tartrate in 500 ml of 0.2 N NaOH, followed by the addition of 5 g KI and making up the volume to 1 litre with 0.2 N NaOH.

Procedure: Five grams of finely grinded mushroom tissue were boiled in 50 ml of 1 N NaOH for 30 minutes. After cooling to room temperature, the mixture was centrifuged at 1000 × g by a table centrifuge machine. The supernatant was collected and analyzed for protein content using the Biuret method.

Determination of Carbohydrate: Total carbohydrates were estimated using the Anthrone method.

Reagents: Anthrone Reagent; 200 mg anthrone dissolved in 100 ml ice-cold concentrated H_2SO_4, Standard Glucose Solution; Prepared by dissolving 100 mg glucose in 100 ml distilled water (stock) and further diluting 10 ml of stock to 100 ml to make the working standard.

Procedure: Aliquots of 0.21 ml from the working glucose standard were taken in five test tubes, diluted to 1 ml with distilled water and 5 ml anthrone reagent was added to each. After mixing, the tubes were heated in a water bath for 10 minutes, cooled and absorbance was recorded at 630 nm. A blank (distilled water + reagent) was also prepared. A standard curve was used to determine sugar concentrations in the samples.

Determination of Fat: Fat content was determined by the Soxhlet extraction method.

Procedure: To estimate the total fat content in the mushroom samples, the following procedure was followed: A known weight of fresh mushroom tissue (e.g., 5 grams) was taken and dried in an oven at 60–70°C until a constant weight was achieved to ensure complete removal of moisture. The dried sample was then weighed and subjected to fat extraction using a Soxhlet apparatus with petroleum ether as the solvent (boiling range: 40–60°C). The extraction process was carried out for 6–8 hours. After completion, the solvent was evaporated, leaving behind the fat residue. The fat content was determined by weighing the residue and calculating it based on the original sample weight.

$$\text{Fat percent} = \frac{\text{Weight of Extracted Fat (g)}}{\text{Weight of Dry Sample (g)}} \times 100$$

Determination of Minerals: Mineral analysis was performed using the dry ashing method.

Procedure: To determine the total mineral content in the mushroom samples, the following procedure was adopted: A known weight of mushroom tissue (e.g., 5 grams) was dried in an oven at 60–70°C to eliminate moisture. The dried sample was then placed in a clean, pre-weighed crucible and subjected to incineration in a muffle furnace at 500–600°C for 4–6 hours to oxidize all organic matter. After incineration, the crucible was allowed to cool in a desiccator to room temperature, and the weight of the remaining ash (inorganic residue) was recorded. This residue represented the total mineral content of the sample.

$$\text{Mineral percent (Ash content)} = \frac{\text{Weight of Ash (g)}}{\text{Weight of Dry Sample (g)}} \times 100$$

III. RESULTS AND DISCUSSION

Cultural characterization of *Pleurotus* species

The growth characteristics of five different *Pleurotus* species were evaluated on two culture media: Potato Dextrose Agar (PDA) and Malt Extract Agar (MEA). The results are presented in Table 1, Fig 1. The species showed considerable variation in terms of radial mycelial growth, nature of the mycelium and growth rate. Among the tested species, *Pleurotus sajor-caju* (DMRP-115) exhibited the maximum mycelial growth of 90.00 mm on both PDA and MEA. Its mycelium appeared white, fluffy to cottony in texture and demonstrated a fast growth rate. *Pleurotus florida* (DMRP-136) also recorded high radial growth, 89.00 mm on PDA and 88.00 mm on MEA. The colony was dense, cottony to fluffy and it was classified as a very fast-growing isolate, comparable to *P. sajor-caju*. In contrast, *Pleurotus citrinopileatus* (DMRP-116) showed lower mycelial growth, particularly on MEA (55.56 mm) compared to PDA (78.50 mm). Its mycelium was cottony to slightly fluffy and it was categorized as moderately fast in growth. *Pleurotus djamor* (DMRP-205) demonstrated aggressive colonization with mycelial growth of 85.00 mm on PDA and 90.00 mm on MEA. The mycelium appeared pure white and initially fluffy. It was considered a very fast and aggressive colonizer, making it potentially suitable for rapid spawn production. On the other hand, *Pleurotus membranaceous* (DMRP-392) showed the least growth on PDA (50.50 mm) but performed better on MEA (85.00 mm). The colony began as fluffy and gradually became dense over time. Its growth rate was classified as slightly slower in comparison to the other species tested.

Table 1: Cultural characterization of Pleurotus species on two different growth media in laboratory conditions

Sr. No.	Oyster Species	Coded Name	Mycelial Growth (mm)*		Nature of mycelium	Growth rate
			PDA	MEA		
1.	*Pleurotus sajor-caju*	DMRP-115	90.00	90.00	White, Fluffy to cottony	Fast growing
2.	*Pleurotus florida*	DMRP-136	89.00	88.00	Dense, Cottony to fluffy	Very fast
3.	*Pleurotus citrinopileatus*	DMRP-116	78.50	55.56	Cottony to slightly fluffy	Moderately fast
4.	*Pleurotus djamor*	DMRP-205	85.00	90.00	Pure white, Fluffy initially	Very fast, aggressive colonizer
5.	*Pleurotus membranaceous*	DMRP-392	50.50	85.00	Fluffy at first, becomes dense over time	Slightly slower
	SEm±		1.45	1.31		
	CD (p=0.05)		4.25	3.89		

*** Avg. of four replications**

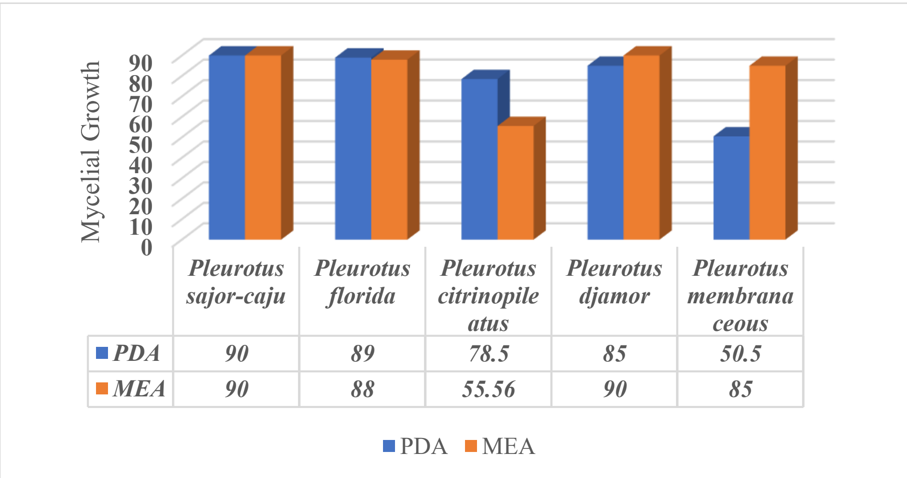

Fig 1: Cultural characterization of Pleurotus species on two different growth media in laboratory conditions

Various researchers have extensively studied the cultural characteristics of *Pleurotus* spp. across different media. This was corroborated by Ahmad *et al*. (2015), who consistently observed superior mycelial growth on PDA. Baral *et al*. (2018) emphasized the efficacy of MEA for specific Pleurotus species. Naik *et al*. (2018) noted wheat extract agar as highly supportive across several mushroom genera. Singh *et al*. (2020) also confirmed PDA's superiority over synthetic and alternative media.

Morphological characterization of *Pleurotus* species

The growth and yield performance of five *Pleurotus* species were evaluated under ambient conditions (Table 2, Fig. 2, 3). Considerable variation was observed among the species in terms of days taken for spawn run, pinhead initiation, total yield, biological efficiency, number of fruiting bodies per bag and average fruit body weight.

Table 2: Growth performance of various Pleurotus species in cropping room

Sr. No.	Oyster Species	Days taken in spawn run	Days taken in pin head initiation	No. of fruiting bodies / bag (2.5 kg)	Total Yield (g) / bag (2.5 kg)	Bio-logical Efficiency (%) / 100 kg substrate	Avg. per fruit body weight (g)
1.	*Pleurotus sajor-caju*	20	25	72	884.88	88.48	12.29
2.	*Pleurotus florida*	18	20	58	735.44	73.54	12.68
3.	*Pleurotus citrinopileatus*	17	21	52	580.32	58.03	11.16
4.	*Pleurotus djamor*	11	8	65	633.75	63.38	9.75
5.	*Pleurotus membranaceous*	20	24	58	497.06	49.70	8.57
	SEm±	0.29	0.32	0.71	91.53	2.48	1.21
	CD (p=0.05)	0.82	0.66	2.10	276.01	7.55	3.68

*** Avg. of four replications**

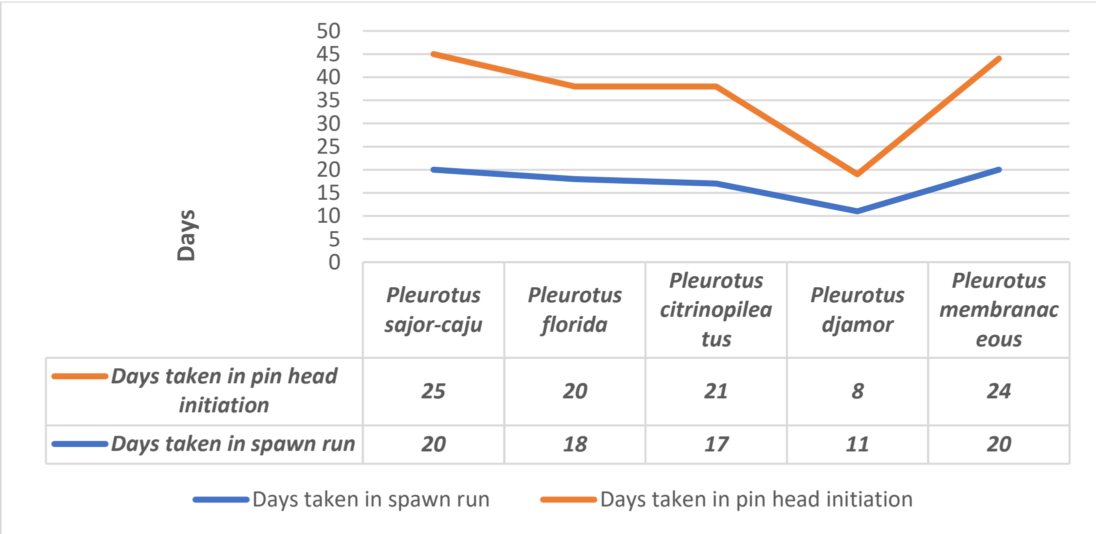

Fig 2: Growth performance of various Pleurotus species in cropping room

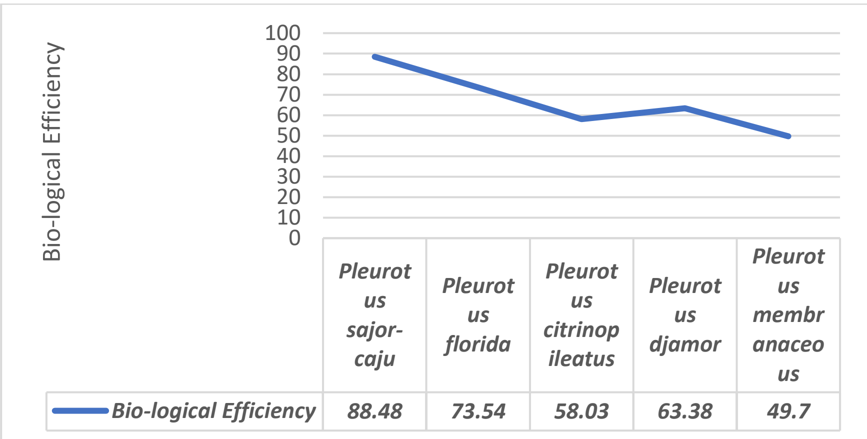

Fig 3: Bio-logical Efficiency of various Pleurotus species in cropping room

Spawn run and pinhead initiation

The shortest spawn run was recorded in *Pleurotus djamor*, which completed colonization in just 11 days, followed by *P. citrinopileatus* (17 days), *P. florida* (18 days), while both *P. sajor-caju* and *P. membranaceous* took the longest time of 20 days. Similarly, *P. djamor* also exhibited the earliest pinhead initiation (8 days), which is an important trait for early cropping. *P. florida* followed closely with 20 days, while *P. sajor-caju* and *P. membranaceous* showed delayed pinning at 25 and 24 days, respectively.

Total yield (biological efficiency)

The highest total yield was obtained from *Pleurotus sajor-caju*, producing 884.88 g per bag, corresponding to a biological efficiency (B.E.) of 88.48%, indicating its superior performance. *P. florida* ranked second in yield (735.44 g) with 73.54% B.E., followed by *P. djamor* (633.75 g, 63.37% B.E.) and *P. citrinopileatus* (580.32 g, 58.03% B.E.). The lowest yield was observed in *P. membranaceous* (497.06 g), with the minimum biological efficiency of 49.70%.

Fruiting body characteristics

Pleurotus sajor-caju produced the highest number of fruiting bodies per bag (72) with an average fruit body weight of 12.29 g, whereas *P. florida* had fewer fruiting bodies (58) but slightly higher average weight (12.68 g), indicating larger individual mushrooms. *P. djamor* produced 65 fruiting bodies with moderate weight (9.75 g), while *P. citrinopileatus* showed 52 fruiting bodies per bag (11.16 g average weight). *P. membranaceous* had the lowest average fruit body weight (8.57 g), despite producing 58 fruiting bodies.

The morphological features of the pileus (fruiting body cap) of five different *Pleurotus* species were examined and characterized based on surface texture, shape, margin and attachment (Table 3). All species exhibited the presence of a pileus, but with distinct interspecific variation in structural features.

Table 3: Morphological characterization of different species of Pleurotus (oyster mushroom)

Sr. No.	Oyster Species	Pileus	Pileus surface	Pileus shape	Pileus margin	Stipe attachment
1.	*Pleurotus sajor-caju*	Present	BSD*	Orbicular, Conchate	Uplifted and wavy	Lateral
2.	*Pleurotus florida*	Present	Dry, Plane, BSD	Plane, conchate	Orbicular, incurved, wavy and split	Lateral
3.	*Pleurotus citrinopileatus*	Present	Glabrous and Dry	Orbicular, Conchate	Small wavy, Split	Lateral
4.	*Pleurotus djamor*	Present	Glabrous	Circular, Conchate	Medium wavy	Lateral to eccentric
5.	*Pleurotus membranaceous*	Present	Glabrous, orbicular, Dry	Conchate	Wavy and split	Lateral

*BSD: Broadly shallowing depressed

Pileus surface and shape

Pleurotus sajor-caju displayed a broadly shallowly depressed (BSD) surface with an orbicular and conchate shape. The margin was uplifted and wavy, giving the cap a characteristic flared appearance. The pileus was laterally attached to the stipe. *Pleurotus florida* showed a dry, plane and BSD pileus surface, with a shape of plane and conchate. The margin varied from orbicular, incurved, wavy and split and the attachment was lateral. This combination gives *P. florida* a distinct, attractive fruit body form. *Pleurotus citrinopileatus* was characterized by a glabrous and dry pileus with an orbicular and conchate shape. Its margin was small, wavy and split and the cap was laterally attached. The smooth surface and delicate margin structure give it a unique visual appeal. *Pleurotus djamor* featured a glabrous pileus with a circular, conchate shape. The margins were medium wavy and attachment was lateral to eccentric, indicating slight off-centering of the stipe. The vibrant color and smooth texture are key identifiers of this species. *Pleurotus membranaceous* exhibited a glabrous, orbicular and dry pileus surface with a typical conchate shape. The margins were wavy and split and the attachment remained lateral. Despite a similar shape to other species, its dull coloration and minimal cap thickness make it distinguishable. The morphological traits of the fruit bodies of five different *Pleurotus* species were recorded (Table 4), focusing on pileus and stipe dimensions, external pigmentation and gill coloration. Considerable interspecific variation was observed in size and pigmentation, contributing to species identification and aesthetic value.

Table 4: Morphological measurement of pileus, shape and pigmentation of different species of Pleurotus

Sr. No.	Oyster Species	Fruit Body Measurement*		Colour/ Pigmentation of fruit body	Gill Pigmentation
		Average diameter of Pileus (L × W) in cm	Average diameter of Stipe (L × W) in cm		
1.	*Pleurotus sajor-caju*	7.5 × 7.0	4.0 × 1.0	Light Blue	Light Blue in young, Hygrophanous in maturity
2.	*Pleurotus florida*	7.0 × 6.0	3.5 × 1.0	White	White
3.	*Pleurotus citrinopileatus*	6.0 × 6.5	3.8 × 1.0	Yellow	Whitish yellow
4.	*Pleurotus djamor*	7.5 × 6.8	1.0 × 1.0	Pink	Pink in young, Hygrophanous in maturity
5.	*Pleurotus membranaceous*	6.0 × 5.0	3.0 × 1.0	Pale Brown	White to pale brownish

*** Avg. of four replications**

Fruit body dimensions

Pleurotus sajor-caju produced large fruit bodies with an average pileus size of 7.5 × 7.0 cm and stipe measuring 4.0 × 1.0 cm. This species exhibited a light blue coloration on both the pileus and gills in the young stage, which transitioned to a hygrophanous appearance at maturity, a condition where tissue becomes translucent or water-soaked upon aging or moisture absorption. *Pleurotus florida* formed slightly smaller fruit bodies with a pileus size of 7.0 × 6.0 cm and stipe dimension of 3.5 × 1.0 cm. It was characterized by a white pileus and white gills, maintaining uniform pigmentation throughout maturity, which is typical of this widely cultivated species. *Pleurotus citrinopileatus* showed a pileus dimension of 6.0 × 6.5 cm and stipe size of 3.8 × 1.0 cm. The fruit body was bright yellow, with whitish yellow gills, offering a visually appealing contrast that is distinctive among *Pleurotus* species. *Pleurotus djamor* produced fruit bodies with a pileus size of 7.5 × 6.8 cm, but the stipe was notably slender and short (1.0 × 1.0 cm). It exhibited pink pigmentation in the pileus and gills during the young stage, which turned hygrophanous at maturity, reflecting moisture sensitivity in mature tissues. *Pleurotus membranaceous* was relatively smaller, with a pileus of 6.0 × 5.0 cm and stipe of 3.0 × 1.0 cm. The fruiting body showed pale brown pigmentation with gills that varied from white to pale brownish as they aged.

Several studies have highlighted the morphological variations among *Pleurotus* species and strains. Sheikh *et al. (2010)* reported that *P. citrinopileatus* produced the lowest average number (51.4) but the highest weight (16.33 g) of fruit bodies, indicating a trade-off between quantity and individual size. Lechner and Alberto (2011) found significant morphological differences among strains of *P. pulmonarius*, *P. albidus*, and *P. sajor-caju*, with the latter exhibiting the highest mycelial growth. Shukla and Jaitley (2011) documented considerable genetic diversity in five *Pleurotus* species, including *P. citrinopileatus*, *P. djamor*, *P. florida*, *P. ulmarius*, and *P. sajor-caju*, based on morphological characteristics. Buchanan *et al.* (2013) highlighted taxonomic distinctions between *P. pulmonarius* and *P. ostreatus*, noting differences in stipe orientation, eccentric in *P. pulmonarius* and lateral in *P. ostreatus*.

Nutritional analysis of different species of *Pleurotus*

The nutritional composition of five *Pleurotus* species was analyzed and found to vary significantly across key parameters such as moisture, protein, carbohydrates, fat and mineral content (Table 5, Fig 4). These values are crucial in determining the dietary and commercial value of the oyster mushrooms.

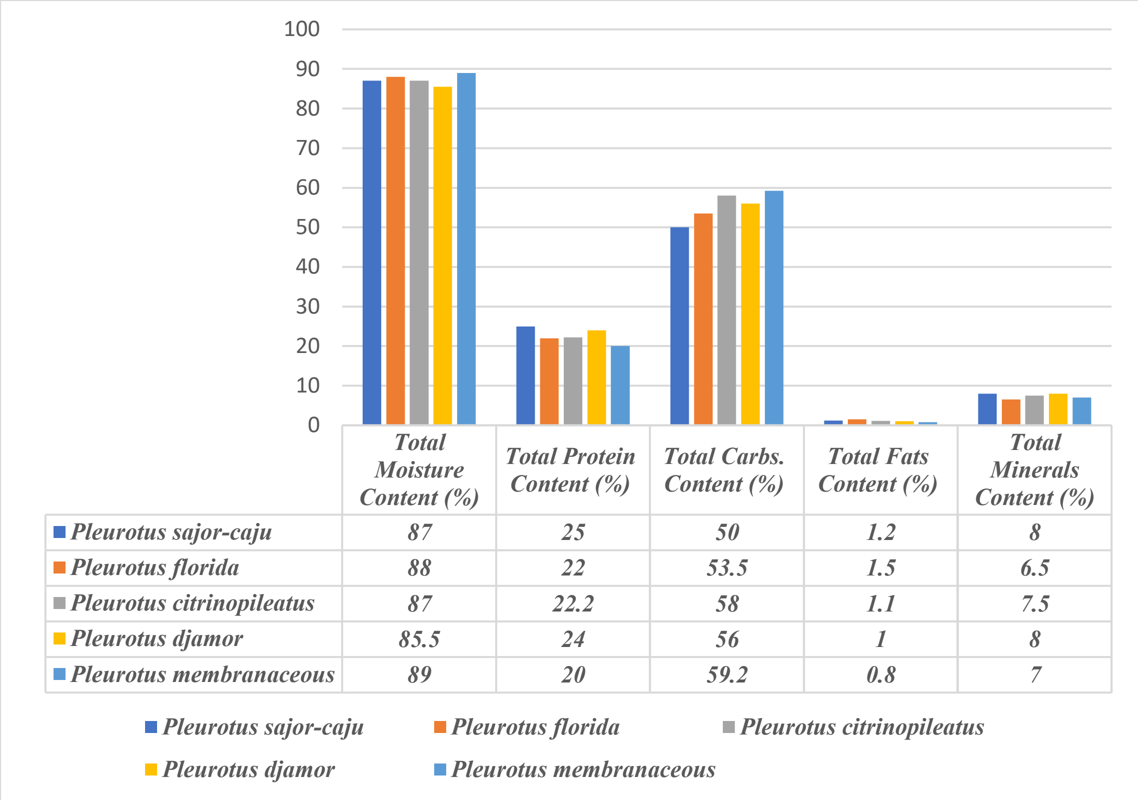

Fig 4: Nutritional analysis of different species of Pleurotus

Moisture content: The highest moisture content was observed in *Pleurotus membranaceous* (89.00%), followed closely by *P. florida* (88.00%) and *P. sajor-caju* and *P. citrinopileatus* (87.00% each). *Pleurotus djamor* had the lowest moisture content (85.50%), which may contribute to a longer shelf life and higher concentration of nutrients in dry matter.

Table 5: Nutritional analysis of different species of Pleurotus (oyster mushroom)

Sr. No.	Oyster Species	Total Moisture Content (%)	Total Protein Content (%)	Total Carbs. Content (%)	Total Fat (%)	Total Minerals (%)
1.	*Pleurotus sajor-caju*	87.00	25.00	50.00	1.20	8.00
2.	*Pleurotus florida*	88.00	22.00	53.50	1.50	6.50
3.	*Pleurotus citrinopileatus*	87.00	22.20	58.00	1.10	7.50
4.	*Pleurotus djamor*	85.50	24.00	56.00	1.00	8.00
5.	*Pleurotus membranaceous*	89.00	20.00	59.20	0.80	7.00
	SEm±	0.57	0.23	0.42	0.03	0.12
	CD (p=0.05)	1.60	0.71	1.28	0.09	0.36

*** Avg. of four replications**

Protein content: *Pleurotus sajor-caju* contained the highest protein content (25.00%), making it the most protein-rich among the tested species. *P. djamor* was next with 24.00%, followed by *P. citrinopileatus* (22.20%) and *P. florida* (22.00%). The lowest protein content was found in *P. membranaceous* (20.00%).

Carbohydrate content: The highest carbohydrate content was recorded in *Pleurotus membranaceous* (59.20%), followed by *P. citrinopileatus* (58.00%), *P. djamor* (56.00%) and *P. florida* (53.50%). *P. sajor-caju* had the lowest carbohydrate content (50.00%), balancing its composition with higher protein and mineral values.

Fat content: All five species had low total fat content, making them suitable for low-fat diets. *P. florida* recorded the highest fat content (1.50%), while *P. membranaceous* had the lowest (0.80%). Other species ranged between 1.00% (*P. djamor*), 1.10% (*P. citrinopileatus*) and 1.20% (*P. sajor-caju*).

Mineral content: Both *Pleurotus sajor-caju* and *P. djamor* exhibited the highest total mineral content (8.00%), reflecting their superior micronutrients profile. *P. citrinopileatus* followed closely with 7.50%, while *P. membranaceous* and *P. florida* recorded 7.00% and 6.50%, respectively.

A wide range of studies have demonstrated the rich nutritional profile of *Pleurotus* species and how substrate composition influences their quality. Khan (2010) conducted a comprehensive analysis of *P. sajor-caju* and *P. florida*, reporting moisture contents between 87–87.5%, with protein and carbohydrates ranging from 20–25% and 39–43%, respectively, and fiber content at 22–23%. Notably, the pileus and gills were richer in protein, while the stipe was higher in fiber. Supporting these findings, Sabaratnam *et al.* (2011) highlighted mushrooms as valuable sources of protein (20–25%), polysaccharides (37–48%), fiber (13–24%), along with essential vitamins and minerals. Akyub and Kirbag (2010) observed protein content ranging from 8.5% to 19.7% in *P. eryngii var. ferulae* cultivated on wheat straw and cotton stalk mixtures supplemented with rice bran. Similarly, Hassan *et al.* (2010) found *P. eryngii* to contain 21.33–24.08% crude protein, with moisture and ash content between 87.63–90.26% and 6.54–8.02%, respectively. Rodrigues *et al.* (2015) found considerable variation in nutritional traits across mushroom species, with *P. citrinopileatus* showing the highest phenolics and *P. eryngii* the highest sugar (64.9 g/100 g) and fat (3.4 g/100 g).

IV. CONCLUSION

Among the evaluated *Pleurotus* species, *P. sajor-caju* proved to be the most promising for commercial cultivation, demonstrating the fastest mycelial growth, highest yield (884.88 g/bag), and maximum biological efficiency (88.48%). It also showed the most balanced nutritional profile, with the highest protein (25.00%) and mineral content (8.00%), moderate moisture, and low fat, making it ideal for high-protein, low-fat diets. *P. florida* also performed well, showing rapid growth, good individual fruit body weight, and adaptability to moderate environmental conditions. *P. djamor* stood out nutritionally with high protein (24.00%), mineral content (8.00%), and the lowest moisture content (85.50%), indicating higher dry matter yield and improved shelf life. In contrast, *P. citrinopileatus* and *P. membranaceous* were rich in carbohydrates (58.00% and 59.20%, respectively), with *P. membranaceous* having the highest moisture and lowest protein levels, making it better suited for short-term use and carbohydrate-rich diets. All tested species maintained low fat content (0.80%–1.50%), reinforcing their suitability for low-fat dietary preferences.

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Plate 3: Growth performance of various *Pleurotus* species in cropping room

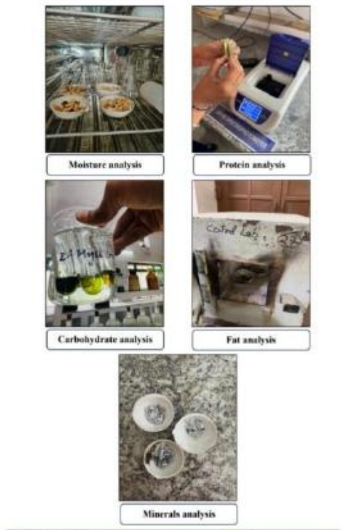

Plate 5: Nutritional analysis of different species of *Pleurotus* (Oyster mushroom)

Plate 2: Cultural characterization of *Pleurotus* species on two different growth media in laboratory conditions

Plate 4: Morphological characterization of *Pleurotus* species