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Cultivation of White Oyster Mushroom (*Pleurotus ostreatus*) in Indralaya

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ABSTRACT

The cultivation of oyster mushrooms (*Pleurotus ostreatus*) in Indralaya is insufficient to supply market, due to limited knowledge and cultivation practices among local communities. This field practice aimed to examine the stages, maintenance methods, marketing strategies, and challenges in oyster mushroom cultivation. The research was conducted at Mr. Eko Supandi's oyster mushroom farm in Payakabung Village, North Indralaya Subdistrict, Ogan Ilir Regency, South Sumatra Province. The case study method was employed. The results revealed that the cultivation process consists of several stages: construction of the mushroom house (kumbung), seed preparation and production, substrate or baglog preparation (including substrate preparation, material mixing and composting, packing, and pasteurization), inoculation, seed incubation for 40–60 days, baglog maintenance, harvesting, and post-harvest handling. Marketing channels include local communities, traditional and modern markets, as well as distributors.

Keywords: baglog, mushroom house, oyster mushrooms, South Sumatera

INTRODUCTION

Oyster mushroom is one of the most widely cultivated mushroom species in Indonesia, accounting for approximately 25% of total production. Its cultivation represents a form of biotechnology that employs simple and practical techniques, making it accessible to rural communities. The development of oyster mushroom farming is supported by the year-round availability of raw materials (baglog) and the favorable climatic conditions in Indonesia that promote optimal growth (Rusadi, 2020).

There is great potential for the development of oyster mushrooms, both to meet domestic demand and to expand exports to countries such as Korea, Japan, China, the Middle East, Russia, France, Germany, and the United States (Kementerian Pertanian RI, 2020).

P. ostreatus are widely cultivated commercially due to their rapid growth on diverse substrates and high nutritional value. According to Hidayat et al. (2020), oyster mushrooms contain approximately 19–35% protein along with essential amino acids, including lysine, methionine, tryptophan, threonine, valine, leucine, isoleucine, histidine, and phenylalanine.

The cultivation of oyster mushrooms has expanded across many regions of Indonesia, with the largest production centers still concentrated on Java Island, particularly in West Java, East Java, Central Java, and Yogyakarta. In Sumatra, Lampung Province remains a promising area for oyster mushroom cultivation, recording a production volume of approximately 1,381 tons in 2023 (Central Statistics Agency of Lampung Province, 2023). National horticultural statistics also indicate that Java continues to dominate oyster mushroom production, while several provinces in Sumatra, including Lampung, offer strong potential for further development (Direktorat Jenderal Hortikultura, 2023; Badan Pusat Statistik, 2024).

These mushrooms are relatively easy to cultivate because they can grow on a wide variety of lignocellulosic substrates—such as straw, sawdust, sugarcane bagasse, rice husks, and even food-waste-derived materials—demonstrating remarkable substrate flexibility (Doroški et al., 2022). They adapt well to moderate temperature ranges (commonly reported around 18–30 °C) and tolerate high humidity without strict environmental requirements (Ladli, 2019). Moreover, *P. ostreatus* exhibits notable resistance to several pests and pathogens. Certain strains express lectin-mediated anti-mite defense mechanisms that help deter predation, while others have been identified as resistant to bacterial brown-blotch disease caused by *Pseudomonas tolaasii* (Liu et al., 2023; Wang et al., 2024). These physiological and biochemical adaptations collectively make *P. ostreatus* a resilient and sustainable mushroom species suitable for commercial cultivation under diverse environmental and resource conditions (Jarial, 2024).

These mushrooms are relatively easy to cultivate because they can grow on a wide variety of substrates, adapt to different temperature & humidity ranges (e.g., 18–30 °C) and show significant resistance to pests and pathogens — such as anti-mite defence mechanisms and bacterial brown-blotch resistance in some strains of Pleurotus ostreatus (Hassanah et al., 2015; Zhang et al., 2013). These characteristics strengthen the rationale for considering this species suitable and profitable for large-scale cultivation. National horticultural statistics also indicate that Java continues to dominate oyster mushroom production, while several provinces in Sumatra, including Lampung, offer strong potential for further development (Badan Pusat Statistik, 2024; Direktorat Jenderal Hortikultura, 2023).

The cultivation of white oyster mushrooms in Indralaya, Ogan Ilir Regency, remains limited and relatively unknown among the local community. Although oyster mushrooms are primarily consumed at the subsistence level and not industrial-scale production, the demand from local markets and culinary businesses continues to increase, particularly due to rising public interest in healthy and plant-based foods. However, data from local markets and small food enterprises indicate that most oyster mushrooms sold in Ogan Ilir are sourced from outside the region, such as Palembang and Prabumulih, showing a supply gap that local producers have not yet been able to fill. This situation highlights the urgency of developing local oyster mushroom cultivation through field practices and training programs aimed at improving farmers' knowledge, increasing production capacity, and supporting the establishment of a sustainable local supply chain.

MATERIAL AND METHOD

This research was conducted from May to September 2023 at the oyster mushroom cultivation site owned by Mr. Eko Supandi in Payakabung Village, North Indralaya Subdistrict, Ogan Ilir Regency, South Sumatra Province.

The instrument used in this field practice included: (1) sterilization/steaming apparatus, (2) wheelbarrow, (3) stationery, (4) Bunsen burner, (5) hoe, (6) bucket, (7) hand sprayer, (8) inoculation needle/spoon, (9) rubber bands, (10) mobile phone camera, (11) ring cover, (12) baglog plastic, (13) rack, (14) ring, (15) water hose, (16) shovel, (17) sprayer, (18) thermometer, (19) tarpaulin, and (20) scale.

The materials used included: (1) water, (2) alcohol, (3) F2 oyster mushroom spawn, (4) rice bran, (5) dolomite, (6) corn, (7) cotton, (8) firewood, (9) questionnaire sheets, (10) newspaper, and (11) sawdust.

The research method this field practice was a case study approach. Direct observation was conducted on the stages of oyster mushroom cultivation, complemented by interviews based on a structured questionnaire. Participatory activities were also carried out by directly engaging in various cultivation processes under the guidance of the farm owner. Furthermore, documentation was undertaken throughout the activities, resulting in data consisting of photographs accompanied by descriptive explanations.

RESULT AND DISCUSSION

Mushroom House (Kumbung) Construction

Kumbung is a mushroom house designed to provide specific environmental conditions for the growth of fungal mycelia, which are placed on horizontally arranged racks (Figure 1). The mycelia of *oyster mushroom* grow optimally, fully colonizing the substrate bags (baglogs), under a temperature range of 24–28 °C and relative humidity of 85–95% (Yuana et al., 2022). A kumbung can be defined as a structure for mushroom cultivation in which baglogs—plastic bags filled with growth substrates—are arranged on racks. The structure may be constructed from wood, bamboo, or metal. Roof materials may include clay tiles, palm leaves, or straw, while asbestos sheets can also be used if lined with thatch to reduce heat absorption (Singh et al., 2018; Kumar & Mathur, 2013).

Figure 1. Kumbung. A) house with a leaf roof and surrounded by netting, B) baglog on a wooden shelf

Mr. Supandi's oyster mushroom cultivation consists of five growing houses (kumbung), each measuring 7 × 9 meters. Four of them are constructed from wood, while one newly built house is made of metal. Each growing house is equipped with racks, hand sprayers or water hoses, and baglogs containing approximately 7,000–10,000 units. The wooden houses have roofs made of woven nipa leaves, whereas the metal house has an asbestos roof lined underneath with thatch. All houses are covered with black netting (waring) on the exterior to maintain a cool and humid microclimate (Ferisya et al., 2025).

Preparation and Production of Oyster Mushroom Spawn

According to Mr. Supandi, one of the most crucial factors in oyster mushroom cultivation is the quality and quantity of the spawn. In his practice, he employs F2 spawn of two varieties, Florida and HU. F2 spawn is derived from F1, while F1 originates from F0. The F0 stage represents the initial mycelium inoculated on Potato Dextrose Agar (PDA) before being transferred to the actual cultivation medium (baglog). This technique aligns with recent studies emphasizing that high-quality spawn and correct generation transfer (F0 → F1 → F2) are vital for consistent yield and contamination control in oyster mushroom production (Aditya et al., 2024a). In genetics, the letter "F" stands for *Filial*, which refers to the offspring resulting from a cross between distinct parental lines (P). These successive generations are designated as F0, F1, F2, and so forth. PDA itself is a standard nutrient medium commonly used for fungal culture initiation (Aditya et al., 2024b).

The preparation of F0, or pure culture of *P. ostreatus*, begins with soaking corn kernels for 24 hours to remove impurities. The kernels are then boiled until half-cooked—soft but not broken—to eliminate contaminant bacteria and fungi. After boiling, the kernels are placed in bottles and sterilized by steaming for 8 hours. A small portion of *P. ostreatus* fruiting body is then aseptically excised and inoculated into the bottles. Inoculation is conducted under sterile conditions, using 70% alcohol for surface sterilization of the parental mushroom and the tools, with procedures carried out near a Bunsen flame to maintain sterility. The inoculated bottles constitute the F0 (parental) culture. The bottles are sealed with cotton and incubated for 15 days until the mycelium fully colonizes the substrate (Pathmashini et al., 2008).

The subsequent stage involves producing spawn from F0 to F1 using the same method and corn kernels as the substrate. This procedure is identical to F0 preparation, except that inoculation is performed using F0 spawn previously cultured in bottles. The incubation of F1 continues until the mycelium fully colonizes the bottles, which takes approximately 20 days. For F2 spawn, Mr. Supandi employs a different substrate composition—sawdust, rice bran, and corn—similar to that used for baglog production, since F2 spawn will later be inoculated into the baglogs. The medium preparation follows the same steps: mixing the substrates in bottles, steam sterilization, inoculation, and finally sealing the bottles with cotton and paper. Throughout the process, strict sterilization is required to prevent contamination and ensure successful mycelial colonization (Obodai et al., 2003).

Cultivation Substrate Preparation

Baglog serves as the substrate for *P. ostreatus* cultivation. It is composed primarily of sawdust, as oyster mushrooms are wood-decaying fungi, supplemented with additional nutrients to support growth (Hunaepi et al., 2018). Typically, baglog is packed into cylindrical plastic containers with an opening at one end, through which the fruiting bodies emerge (Tranggono et al., 2021).

The cultivation medium consisted of sawdust, rice bran, lime, corn, and water. The formulation required 100 kg of sawdust, 25 kg of rice bran, 2 kg of lime, and 2 kg of corn. In a single production cycle, Mr. Supandi produced approximately 3,000 baglogs. The use of these materials is common, as reported by Triyanto & Nurwijayanti (2016), who noted that the preparation stage of oyster

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mushroom cultivation typically employs sawdust, rice bran, lime, and gypsum.

Sawdust serves as a suitable growth substrate for *P. ostreatus* due to its nutrient content and lignin composition. It is widely available as a byproduct of sawmilling. Wood types commonly used include sengon, red meranti, and rambutan, whereas wood with high resin content is less suitable because it decomposes slowly, limiting nutrient absorption by the fungus (Febriani & Khairuna, 2020). Bran is often added as a nutritional supplement, providing protein, cellulose, fiber, nitrogen, fat, and P_2O_5 to support fungal growth. Lime is incorporated to regulate the substrate pH, as optimal pH conditions enhance nutrient availability and thereby promote mycelial development (Zulfarina et al., 2019).

The mixing of substrates aims to provide a nutrient source suitable for the natural growth conditions of oyster mushrooms. The mixture is prepared using a stirring machine with proportions of 3 buckets of sawdust, 5 dippers of bran, 100 g of lime, 100 g of corn, and 10 dippers of water. The prepared materials should be thoroughly homogenized to ensure even mycelial growth throughout the cultivation medium. The sawdust used should preferably be decayed and finely powdered, allowing the chemical compounds within the wood to be more easily decomposed by the fungus, thereby enhancing mushroom growth (Imran et al., 2019).

Composting (after mixing) involves gathering the prepared substrate and covering it with a tarp for 1–2 days. Rosmiah et al. (2020) noted that composting is carried out by piling the materials together and sealing them with a tarpaulin. According to Triyanto and Nurwijayanti (2016), composting serves to reduce contamination by wild microorganisms and to facilitate the breakdown of complex compounds into simpler forms that are more easily absorbed by the mushrooms.

Packaging of Substrate

Packaging (logging) is the stage after two-day fermentation process. The substrate is packed in heat-resistant transparent plastic, particularly to withstand the sterilization process. The plastic used is clear polypropylene to prevent tearing during sterilization. As stated by Shintia & Amalia (2017), packaging follows the composting stage. The growing medium is placed into thick polypropylene bags measuring 20 × 30 cm with a capacity of 1000 g and then compacted. Packaging may be performed manually, and compaction is carried out until the medium reaches a height of approximately 20 cm.

The substrate must be compacted not only to prevent leakage during sterilization but also to reduce the risk of rapid spoilage due to loose conditions. To ensure uniform substrate weight, each bag is weighed after wrapping. In the packaging process, workers attach polypropylene plastic to the machine, set the baglog weight at 1.3 kg, and load the substrate. The machine then automatically inserts the substrate into the plastic and compacts it (Ferisya et al., 2025).

Baglog Pasteurization

Pasteurization is a heating process at temperatures not exceeding 100 °C for no less than 5 hours (Untari, 2020). In practice, baglogs are heated at 100 °C for 8 hours using steam generated from burning rubber wood, which is chosen for its low cost and availability. The purpose of pasteurization is to inactivate microorganisms that may inhibit oyster mushroom mycelial growth (Figure 2). As noted by Febriani and Khairuna (2020), freshly prepared baglogs still harbor numerous microbes and wild fungi, thus requiring pasteurization.

Failures in spawn production are often linked to inadequate pasteurization. Effective pasteurization generally involves steaming the baglogs for at least 3 hours at 100 °C, while most producers extend heating to 8–12 hours (Triyanto & Nurwijayanti, 2016). After sterilization, the baglogs are cooled for approximately one day before further use.

The pasteurization process in Mr. Supandi's oyster mushroom cultivation involves approximately 3,000 baglogs per batch, placed into a box-shaped pasteurization chamber with a capacity exceeding 3,000 units. Inside the chamber, mesh racks are used to hold the baglogs. Externally, a water-filled drum is connected to the chamber via a hose, supplying steam generated by burning firewood beneath the drum. The pasteurization process typically lasts about 8 hours. This method relies on steaming the baglogs, consistent with Febriani & Khairuna (2020), who state that effective sterilization is achieved by steaming at 100 °C for at least 3 hours.

Inoculation

Inoculation is a critical stage in mushroom cultivation, as sterility must be strictly maintained. According to Riski et al. (2021), inoculation is the process of transferring oyster mushroom spawn into baglogs. This procedure requires a clean, dust-free room to minimize the risk of contamination. Prior to inoculation, the room is sterilized, typically by spraying with alcohol. In addition, all tools used in the process must be sterilized, and workers are required to disinfect their hands and feet with alcohol before handling the spawn.

Incubation

The incubation of oyster mushroom spawn is carried out in a specialized room before being transferred to the main cultivation house, as the latter has different humidity and temperature conditions. The incubation room must be sterilized with alcohol or formalin prior to use. Incubation is the period of mycelial growth until the substrate is fully colonized. Once complete, the spawn can be moved to the cultivation house. According to Riski et al. (2021), the incubation phase represents the growth of matured spores into mycelium, lasting approximately 21–49 days. During this stage, it becomes evident whether the spawn develops successfully or fails. Indicators of failure include a color change of the substrate from dark brown to light brown and the mycelium turning black.

The incubation temperature for mycelial growth of oyster mushrooms

Figure 2. Pasteurization equipment. A. Transferring the baglog into the pasteurization equipment, B. Pasteurization process.

ranges between 22–28°C with a relative humidity of 60–80%, while fruit body formation requires 16–22°C with 80–90% humidity. Temperature and humidity can be regulated by spraying clean water into the cultivation room. Adequate air circulation is essential, and approximately 10% light intensity is required during growth (Rosmiah et al., 2020).

The incubation room is maintained under dark and humid conditions, as oyster mushroom mycelium requires such an environment during the incubation phase. To prevent excessive heat from sunlight, the room is covered with black mesh (waring). The incubation room contains numerous baglogs in which the mycelium develops. Although prepared at the same time, each baglog exhibits different growth rates. The production of baglogs is carried out gradually rather than all at once (Purwitasari, et al., 2025).

Growth and Maintenance of Baglog

The incubation period of 40–60 days allows the baglog to become fully colonized by *P. ostreatus* mycelium, which spreads uniformly throughout the substrate. Successful colonization is indicated by the baglog turning entirely white without black discoloration. After incubation, the colonized baglogs are transferred to cultivation houses (kumbung) and arranged on racks until the harvesting stage.

This stage requires a room with minimal light, while the temperature necessary for mushroom growth differs from that of the incubation phase and must remain below 28 °C. Humidity needs to be higher than during incubation, ranging from 80% to 90%. Suitable temperature and humidity conditions can be maintained through frequent misting or spraying.

According to Abduh et al. (2023), the success of oyster mushroom cultivation is determined by two main factors: (1) cleanliness (sterilization) of the facility, equipment, and workers, including the use of masks during inoculation to minimize contamination; and (2) maintaining temperature and humidity within the required standards. Excessive temperature or insufficient humidity may hinder or even prevent fruiting body development; thus, continuous monitoring of the growing house environment is essential.

Watering and misting were carried out daily at 09:00 and 16:00 using either a hose connected to a water sprayer or a hand sprayer to maintain the temperature and humidity of the mushroom house. During the dry season, additional watering was required at midday due to rising temperatures and decreasing humidity. In contrast, during the rainy season, watering was performed only once a day.

Figure 3. *Neurospora* sp.

According to Imran et al. (2019), humidity should be reduced to 70–80% once the mycelium reaches maturity to prevent excessive softness of the fruiting bodies, which may lead to reduced shelf life or rapid decay.

Harvesting and Post-Harvest

Harvesting is carried out once fruiting body primordia have developed, preferably in the morning or afternoon when mushrooms remain fresh. Oyster mushrooms can remain productive for 3–4 months per cultivation bag, with 3–4 harvest cycles. Mature mushrooms are typically ready for harvest 3–4 days after primordia formation. Pinheads usually appear 1–2 weeks after removing the paper cover. According to Manukovsky et al. (2023), harvesting can be conducted 1–2 weeks after removing the cotton plug. Oyster mushrooms are ready for picking about two days after primordia emergence. Harvesting is best performed in the morning by pulling out the entire cluster and cleaning it immediately.

Following the sorting process, the next step is packaging. The mushrooms are placed into plastic bags, weighed to 1 kg, wrapped with newspaper, and tied with air bubbles left inside to prevent rapid decay and wilting. The newspaper serves to absorb moisture released by the mushrooms during distribution, thereby maintaining freshness. The target markets for Mr. Supandi's oyster mushrooms include traditional markets, local communities, and wholesalers.

Constraints

The occurrence of pests and diseases in oyster mushroom cultivation is primarily attributed to inadequate management practices, particularly during maintenance. These infestations, transmitted through air, water, soil, or human activity, require immediate intervention to prevent economic losses. Improper handling of baglogs further exacerbates their prevalence. Thus, understanding the sources of contamination is critical, with strict hygiene and sanitation serving as the key preventive measures. Additionally, climatic factors play a significant role in the emergence of pests and diseases (Ferisya et al., 2025).

Diseases affecting mushroom baglogs may be caused by fungi, viruses, or bacteria. During observations, infections by *Trichoderma* sp. were found in both the F2 spawn cultivation phase and the baglogs. The presence of *Trichoderma* sp. was indicated by green spots on the baglogs, which inhibited the growth of *Pleurotus ostreatus* mycelia. The appropriate control measure is the removal of infected baglogs, while prevention can be achieved through sterilization of workers and equipment used in mushroom house maintenance.

In addition to *Trichoderma* sp., contamination by *Neurospora* sp. was also observed. The presence of *Neurospora* sp., commonly known as oncom mold, was indicated by the appearance of orange mycelia on the newspaper covering the substrate bags (Figure 3). This fungus thrives in carbohydrate-rich environments, leading to rapid growth on substrates with high sugar content. The control method applied by Mr. Supandi was the removal of the oncom mold from the surface of the bag covers (Purwitasari et al., 2025)

Temperature and humidity are major challenges frequently encountered by oyster mushroom farmers. Both factors must meet the optimal growth requirements in incubation and cultivation houses. However, estimating temperature and humidity in lowland areas such as Payakabung Village remains difficult. During the dry season, when temperatures may reach 37 °C, humidity inside the cultivation house decreases significantly, requiring intensive misting or watering. Typically, watering is conducted twice daily during the dry season, but when temperatures rise further, it may increase up to four times per day (Sardar et al., 2020).

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CONCLUSION

Growing white oyster mushrooms involves several key steps. It starts with building the growing house, preparing and spreading the spawn, and making the planting media (called baglogs). This process includes mixing and composting materials, packing the media, and pasteurizing it. After that, the spawn is added, followed by an incubation period of 40–60 days, regular maintenance, harvesting, and handling after harvest. Several challenges affect the cultivation process, including pest attacks by mites, rats, squirrels, snails and fungus. Temperature and humidity change also make the process more difficult. Low interest in oyster mushroom cultivation in Ogan Ilir is mainly caused by limited technical knowledge and inadequate production infrastructure, which make the activity appear risky and less profitable compared to other farming.

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