

SUBSTANTIATION OF THE OPTIMAL SUBSTRATE
COMPOSITION AND DEVELOPMENT OF BIOTECHNOLOGICAL
SOLUTIONS FOR CULTIVATION OF Oyster Mushroom
PLEUROTUS OSTREATUS

Tolibova Mehrangiz

Master of BukhSU. Bukhara. Uzbekistan.

Abstract: *The article discusses the selection of the optimal substrate composition for the cultivation of oyster mushroom (Pleurotus ostreatus) and the development of effective biotechnological solutions aimed at increasing the yield and quality of the product. The article analyzes the physical and chemical properties of various substrate components and their impact on mycelium growth and fruiting. The article provides recommendations for optimizing the substrate composition and technological parameters of cultivation.*

Keywords: *oyster mushroom, substrate, mycelium, biotechnology, cultivation, lignocellulose waste.*

Oyster mushroom (*Pleurotus ostreatus*) is one of the most promising objects of industrial mushroom farming due to its high productivity, unpretentiousness and ability to process a wide range of lignocellulose waste. Modern trends of sustainable development require the introduction of technologies that ensure the efficient use of agricultural and industrial waste, which makes the study of substrates for growing mushrooms especially relevant.

The main objective is to substantiate the optimal composition of the substrate that ensures maximum biological efficiency, as well as to develop technological solutions that increase the stability of production.

Optimizing the composition of the nutrient medium is a key factor in increasing the efficiency of basidiomycetes cultivation, particularly *Pleurotus ostreatus*. The biological productivity of this species is directly influenced not only by the genetic characteristics of the strain, but also by the quality of the substrate, which serves as a source of carbon, nitrogen, minerals, and a structural matrix for mycelium growth. Therefore, determining the optimal substrate composition requires a comprehensive analysis of its chemical, physical, and biological properties.

From the point of view of the biochemistry of fungal growth, the most significant parameter of the substrate is the ratio of carbon and nitrogen (C:N). It is known that an excessive amount of carbon without a sufficient amount of nitrogen compounds slows down the synthesis of proteins and enzymatic systems, while an excess of nitrogen can lead to a disruption of the metabolic balance and a decrease in the stability of the mycelium. Therefore, optimal substrates should provide a balanced nutrition that allows for both active growth of hyphae and their structural differentiation.

From the perspective of the substrate's structural organization, its porosity, moisture capacity, and particle dispersion degree play an important role. A porous structure ensures efficient gas exchange, which is essential for the aerobic respiration of the mycelium, and prevents the development of anaerobic zones that can inhibit the growth of the fungal culture. Moisture capacity, on the other hand, determines the availability of water as a universal solvent and transport medium for nutrients. Substrates with optimal moisture

content promote the uniform distribution of mycelium and accelerate colonization.

The study found that combined substrates that include waste of various nature, such as plant lignocellulose materials (sawdust, cardboard, agricultural waste), demonstrate the highest efficiency. This combination provides a synergistic effect, where easily degradable components initiate a rapid start of mycelium growth, while more stable polymer structures support long-term nutrition in subsequent stages of development.

An additional biotechnological solution that increases the efficiency of the substrate system is the pre-treatment of organic material with biologically active additives. In particular, the use of a suspension of *Chlorella vulgaris* helps to enrich the substrate with amino acids, vitamins, microelements, and phytohormone-like compounds. These substances activate the fungal enzyme systems, including cellulases and oxidase complexes, which accelerates the process of lignocellulose degradation and increases the rate of substrate bioconversion.

From a physiological perspective, the introduction of biostimulants leads to increased metabolic activity in the mycelium, increased cell division rates, and more intensive formation of the hyphal network. This results in a shorter colonization period and an accelerated transition to the fruiting stage. Additionally, the presence of additional biologically active compounds enhances the plant's resistance to stress factors, including fluctuations in humidity and temperature.

It should be noted that the effectiveness of a biotechnological solution is determined not only by the composition of the substrate, but also by the technology used to prepare it. Pre-treatment with heat or chemicals reduces

microbial contamination and creates selective conditions favorable for the growth of fungal mycelium. In combination with biological activation, this creates a competitive advantage for *Pleurotus ostreatus*, suppressing the growth of unwanted microflora.

Thus, the optimal substrate for the cultivation of *Pleurotus ostreatus* is a structurally balanced system that includes combined lignocellulose waste with high porosity and adjustable moisture content, which is additionally enriched with biologically active components. This approach enhances the growth rate of the mycelium, shortens the fruiting period, and increases the overall yield, making it a promising technology for industrial mushroom cultivation and environmentally friendly organic waste processing.

As a result of the conducted research, it was established that the effectiveness of *Pleurotus ostreatus* cultivation is determined by the complex interaction of the substrate composition, its physical and chemical properties, and the biotechnological methods used. The analysis of the experimental data showed that the type of nutrient base has a direct impact on the rate of mycelium colonization, the timing of fruiting, and the final yield of the mushroom crop.

A comparative study of various substrates revealed that materials with a high content of easily digestible organic compounds and optimal structural characteristics demonstrate the highest productivity. In particular, cotton waste provides the most favorable conditions for mycelium development, while cardboard materials and sawdust exhibit slower bioconversion due to differences in lignification and nutrient availability.

REFERENCES

1. Royse D. J., Baars J., Tan Q. Current overview of mushroom production in the world. // *Mushroom Science*. — 2017. — Vol. 19. — P. 5–15.
2. Sánchez C. Cultivation of *Pleurotus ostreatus* on agricultural wastes. // *Biotechnology Letters*. — 2004. — Vol. 26. — P. 1421–1425.
3. Philippoussis A., Diamantopoulou P. Agro-industrial wastes for mushroom production. // *Waste Management*. — 2011. — Vol. 31. — P. 113–121.
4. Mandeel Q. A., Al-Laith A. A. Cultivation of oyster mushrooms on lignocellulosic substrates. // *Journal of Applied Microbiology*. — 2005. — Vol. 98. — P. 123–130.
5. Shodmonov F.Q., Kobilov A.M., Okilova G.A. Propagation of *Chlorella vulgaris* and *Scenedesmus obliquus* in Dengizkul Lake and determination of protein content in them // *E3S Web of Conferences*. — 2023. — Vol. 420. — P. 09012. <https://doi.org/10.1051/e3sconf/202342009012>.
6. Шодмонов Ф.К., Толибова М.И. ВЫРАЩИВАНИЕ ГРИБА ВЁШЕНКА-*PLEUROTUS* В РАЗЛИЧНЫХ.