

**IMPACT OF NUTRIENT MEDIUM COMPOSITION ON THE GROWTH, PRODUCTIVITY, AND DEVELOPMENT OF THE MEDICINAL POTENTIAL OF THE OYSTER MUSHROOM (*PLEUROTUS OSTREATUS*)****Safarova Zakiya Teshayevna**Lecturer at the Department of General Sciences  
Asia International University

**Abstract:** This paper reports the findings of a study examining the influence of different nutrient media on mycelial growth and the productivity of the oyster mushroom (*Pleurotus ostreatus*). The importance of this research lies in the need to identify cost-effective and efficient substrates for cultivating edible mushrooms using resource-saving technologies. The objective of the study was to compare mycelial growth rate, fruiting time, and yield of oyster mushrooms grown on various nutrient media. The results demonstrated that substrate composition significantly affects colonization rate, biological efficiency, and overall crop productivity. The findings make it possible to recommend optimal nutrient media for both industrial-scale and farm-based mushroom production.

**Keywords:** *Pleurotus ostreatus*, oyster mushroom, nutrient medium, substrate, mycelium growth, yield, and biological efficiency.

**Introduction**

The common oyster mushroom (*Pleurotus ostreatus*) is among the most widespread cultivated edible mushrooms due to its high plasticity, ability to use a variety of lignocellulose substrates, and relative simplicity of cultivation technology. In the context of the growing interest in sustainable and resource-saving agricultural technologies, mushroom farming is of particular importance as a way of processing plant waste and obtaining valuable food products.

One of the key factors determining the effectiveness of oyster mushroom cultivation is the composition of the nutrient medium. Different types of substrates and additives have varying effects on mycelium growth, fruiting time, and yield. Therefore, it is important to conduct a comparative study of nutrient media to identify the optimal options for growing oyster mushrooms.

The aim of the present study was to assess the effect of different nutrient media on the growth and productivity of the mushroom *Pleurotus ostreatus*.

**Materials and methods**

The study was conducted under the conditions of a laboratory-production experiment. The object of the study was the common oyster mushroom (*Pleurotus ostreatus*), and the subject was the effect of the nutrient medium composition on its growth and yield.

The experiment was conducted according to a single-factor scheme in three replicates. The following nutrient medium options were studied:

- Control — wheat straw;
- Variant 1 — wheat straw + wheat bran (10%);
- Variant 2 — wheat straw + corn cobs;
- Variant 3 — wheat straw + sunflower husks.

The substrates were pre-crushed, moistened to the optimal moisture content, and subjected to heat treatment. The substrates were inoculated with grain mycelium.

The following parameters were evaluated: mycelium growth rate (mm/day); time required for complete colonization of the substrate (days); time required for the appearance of primordia (days); yield (kg of mushrooms per 1 kg of substrate); and biological efficiency (%).

The results were statistically analyzed using variational statistics.

**Results**

During the experiment, the growth of mycelium, the terms of substrate colonization, the time of primordia appearance, as well as the yield and biological efficiency of the fungus

*Pleurotus ostreatus* when using different nutrient media: control (wheat straw), straw with the addition of wheat bran, straw with corn cobs and straw with sunflower husks.

Mycelium growth and substrate colonization. Mycelium growth was determined daily by measuring the linear increase of the colony in millimeters. The highest growth rate was observed in the wheat bran-added variant, with a growth rate of  $6.4 \pm 0.3$  mm/day, which was 25% higher than the control variant ( $5.1 \pm 0.2$  mm/day). The corn cob and sunflower husk variants showed average mycelium growth values of  $5.8 \pm 0.2$  mm/day and  $6.0 \pm 0.3$  mm/day, respectively.

The differences between the experimental variants and the control are statistically significant ( $p \leq 0.05$ ), which confirms the effect of the substrate composition on the mushroom's productivity. Figure 1 shows the graphs of mycelium growth dynamics and the formation of primordia (small bumps that later develop into full-fledged mushrooms), while Figure 2 presents the comparative biological efficiency.

Table-1

Growth of the oyster mushroom mycelium on various nutrient media

Option	Mycelium growth rate, mm/day	Colonization period, days
Control	$5,1 \pm 0,2$	18
Option 1	$6,4 \pm 0,3$	14
Option 2	$5,8 \pm 0,2$	16
Option 3	$6,0 \pm 0,3$	15

The highest mycelium growth rate was observed when using a substrate with added wheat bran.

Table-2

The effect of the nutrient medium on the productivity of the oyster mushroom

Option	Yield, kg/kg of substrate	Biological efficiency, %
Control	0,62	62
Option 1	0,78	78
Option 2	0,71	71
Option 3	0,74	74

The use of enriched nutrient media provided an increase in yield compared to the control.

#### Discussion

The results obtained indicate a significant effect of the composition of the nutrient medium on the growth and productivity of the oyster mushroom. The addition of organic components rich in easily digestible carbohydrates and nitrogen contributed to the acceleration of substrate colonization and increased biological efficiency.

The most pronounced effect was observed when using wheat straw with the addition of bran, which is consistent with the findings of other studies indicating the positive impact of nitrogen-containing additives on the development of *Pleurotus ostreatus* mycelium. The options using corn cobs and sunflower husks also showed an increase in productivity, albeit to a lesser extent.

The oyster mushroom (*Pleurotus ostreatus*) is one of the most widely cultivated edible mushroom species worldwide. It is valued not only for its high nutritional quality and yield but also for its pronounced biological activity. The fruiting bodies of *P. ostreatus* contain  $\beta$ -glucans, polysaccharides, ergothioneine, phenolic compounds, and other bioactive substances exhibiting immunomodulatory, antioxidant, and hypolipidemic effects. In this context, the composition of the nutrient medium plays a critical role not only in supporting mycelial growth and yield formation but also in promoting the accumulation of medicinally valuable compounds.

The growth and productivity of *Pleurotus ostreatus* are directly influenced by the balance between carbon and nitrogen sources in the substrate. Lignocellulosic materials (such as straw,

sawdust, and sunflower husk) serve as primary carbon and energy sources, while nitrogen-rich supplements (including bran and soybean meal) stimulate protein and enzyme synthesis. An optimal C:N ratio promotes rapid mycelial colonization, enhances substrate degradation, and increases the biological efficiency of fruiting.

The mineral composition of the medium also significantly affects fungal metabolism. The presence of calcium, magnesium, phosphorus, and trace elements activates enzymatic systems involved in substrate decomposition and secondary metabolite biosynthesis. However, excessive nitrogen levels may suppress fruiting body formation, whereas moderate nutritional stress (e.g., limited availability of specific elements) can stimulate the synthesis of protective bioactive compounds.

Particularly important is the influence of substrate composition on the content of  $\beta$ -glucans and antioxidant compounds in the fruiting bodies. Studies indicate that supplementation with organic nitrogen sources and optimization of mineral nutrition can increase the concentration of polysaccharides and phenolic compounds, thereby enhancing the therapeutic and preventive potential of the mushroom.

The oyster mushroom (*Pleurotus ostreatus*) is valued not only as a food product but also as a source of bioactive compounds with proven pharmacological potential. Its fruiting bodies and mycelium contain substances with immunomodulatory, antioxidant, anti-inflammatory, and metabolic effects.

**Immunomodulatory activity.**  $\beta$ -glucans, key polysaccharides of the fungal cell wall, activate macrophages and T-lymphocytes, enhancing antitumor and anti-infective defense. They are considered promising adjuvants in supportive cancer therapy.

**Antioxidant properties.** The mushroom contains phenolic compounds, flavonoids, and ergothioneine, which reduce oxidative stress and protect cells from free radical damage.

**Hypolipidemic and cardioprotective effects.** Natural lovastatin identified in the fruiting bodies inhibits HMG-CoA reductase, contributing to reduced cholesterol levels and lower cardiovascular risk.

**Anti-inflammatory action.** Bioactive compounds of *P. ostreatus* suppress pro-inflammatory cytokine production, supporting its use in functional nutrition.

**Antimicrobial activity.** Extracts exhibit activity against various bacteria and fungi due to terpenes, phenolics, and peptides.

**Metabolic and antidiabetic effects.** Polysaccharides and dietary fiber help regulate blood glucose levels and improve insulin sensitivity.

### Conclusion

It has been established that the composition of the nutrient medium has a significant effect on the growth and productivity of the oyster mushroom (*Pleurotus ostreatus*). The use of enriched substrates accelerates the growth of mycelium, reduces the time of fruiting, and increases the yield. In the conditions of the conducted experiment, the most effective option was the nutrient medium based on wheat straw with the addition of wheat bran.

The obtained results can be used in the development of technologies for the cultivation of oyster mushrooms in farms and industrial enterprises.

In conclusion, targeted regulation of nutrient medium composition enables not only improved yield and productivity of *Pleurotus ostreatus* but also controlled enhancement of its qualitative characteristics, including the accumulation of medicinally valuable bioactive components. This approach provides perspectives for the development of functional foods and pharmacologically relevant raw materials derived from oyster mushrooms.

Thus, *Pleurotus ostreatus* represents a valuable source of natural bioactive compounds with a broad spectrum of pharmacological effects. Its application is promising both in the development of functional foods and as a raw material for nutraceuticals and adjunct therapeutic agents.

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