

THE ROLE OF NUTRIENT MEDIUM COMPOSITION IN THE GROWTH AND PRODUCTION EFFICIENCY OF THE OYSTER MUSHROOM (*PLEUROTUS OSTREATUS*)

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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 ± 0.3 mm/day, which was 25% higher than the control variant (5.1 ± 0.2 mm/day). The corn cob and sunflower husk variants showed average mycelium growth values of 5.8 ± 0.2 mm/day and 6.0 ± 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.

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.

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