

Висновки. За результатами досліджень встановлено, що за удобрення розторопші плямистої органічними добривами підвищується коефіцієнт накопичення свинцю, кадмію, цинку та міді у насінні, особливо за використання перегною та дефекату, порівняно менше за використання сидератів. Тоді як при вирощуванні розторопші плямистої після чотирирічного попередника люцерни посівної без використання підживлення даної культури протягом даного періоду дає можливість очистити ґрунти від важких металів внаслідок фітореMediaції та знизити у листовій масі та насінні концентрацію свинцю, кадмію, цинку та міді нижче гранично допустимих концентрацій.

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INTENSIFICATION OF GROWTH PARAMETERS OF THE MUSHROOMS *PLEUROTUS OSTREATUS* UNDER SOLID-PHASE CULTIVATION ON AGRICULTURAL WASTE

*The effect of laser irradiation of vegetative mycelium on growth parameters of *P. ostreatus* during cultivation on agricultural waste has been studied. It is shown that the greatest stimulation of growth processes was observed in response to the action of light irradiation with a wavelength of 532 nm when cultivated on a substrate with 100% wheat straw content. The results of studies on the duration of the processes of formation of the rudiments of fruiting bodies and their number show that the irradiation of the mycelium with light wavelength of 532 nm reduces the fouling time of the substrate of wheat straw by 6 days.*

Key words: vegetative mycelium, cultivated, agricultural waste, substrate.

Due to the ability of xylotrophic fungi to grow on a variety of cellulose-containing substrates, such as cereal straw, corn cobs, sawdust, pulp, cotton and oil palm waste, banana leaves, coconut husks, tree bark and leaves, flax, their cultivation can be effectively processed for cultivation. agriculture, which will allow to produce products rich in protein and biologically active components and will help to reduce environmental pollution. On the other hand, the use of mushrooms as food will overcome protein deficiency in developing countries [1-3].

Based on standard methods of growing mushrooms, researchers add new technological components of this process, which reduce the time of cultivation, increase yields and quality of fruit bodies.

The use of artificial light to stimulate biological processes in mushroom growing is currently limited to methods that require long-term illumination of crops at different stages of morphogenesis, which leads to additional energy consumption. Given the literature on photoreception in fungi, we can conclude that the feasibility of using light to regulate the morphogenesis and biological activity of fungi, which may be the basis for creating more effective technologies for their cultivation. It should be noted that the use of helium-neon and argon lasers, which have large dimensions and significant energy consumption, complicates the technology of stimulating the growth and development of fungi. In addition, they have a relatively low cost and require low energy consumption in use. However, in the literature there is only a small amount of information about the effect of LED laser systems on the growth parameters of fungi, and this issue requires further detailed study.

In order to study the effect of laser irradiation on the growth of fungi, the vegetative mycelium of *P. ostreatus* fungus strains was cultured for 7 days on agar medium in standard Petri dishes (9 cm in diameter). Before inoculation, the mycelium was irradiated. The seed mycelium of the fungus *P. ostreatus* was obtained by well-known methods [4].

Fruit bodies were obtained in the process of intensive cultivation [4] on the following substrates: sunflower husk (SH), wheat straw (WS) and flower scales of corn origin (FS), mixed in different proportions. Based on the results of our previous studies [5] and taking into account the literature data [6], the irradiation energy in all variants of the experiment was 51.1 mJ/cm², the duration of exposure was 10 s. The efficiency of using seed laser mycelium irradiated with LED lasers to increase the rate of substrate fouling, reduce the duration of the processes of formation of fruiting bodies, increase their number was studied.

Analysis of the results of our research on the duration of the processes of formation of fruiting bodies and their number shows that irradiation of the mycelium with green light with a wavelength of 532 nm (irradiation energy 51.1 mJ/cm²) reduces the fouling time of wheat straw substrate by 6 days. For other substrates (except SH (100%)) this period was reduced by 3-4 days. Laser irradiation of mycelium cultured on a substrate of sunflower husk reduced the fouling period by only 1 day. During the study of the process of primordial formation and the beginning of fruiting, the acceleration of these processes by 4–5 days was found. Only for mycelium cultivated on a substrate of wheat straw under the action of laser irradiation, the process of formation of primordia and the beginning of fruiting was reduced by 1-2 days (Table 1).

Table 1. **Growth parameters of the fungus *Pleurotus ostreatus* under the action of laser irradiation**

Substrate composition	Term of substrate fouling, day	Term of emergence of primordia, day	Beginning of fruiting, day
1	2	3	4
SH (100 %)	11–12	25–26	34–35
WS (100 %)	8–9	21–22	24–25*
FS (100 %)	8–9	19–20	30–31*
WS:SH:FS (50:25:25 %)	8–9	21–22	30–31*
WS:SH:FS (25:50:25 %)	11–12	25–26	34–35*
WS:SH:FS (25:25:50 %)	8–9	19–20	24–25*
532 nm (irradiation energy 51.1 mJ/cm ²)			
SH (100 %)	5–6	23–24	33–34*
WS (100 %)	7–8	20–21	20–21*
FS (100 %)	5–6	15–16	29–30*
WS:SH:FS (50:25:25 %)	5–6	17–18	26–27*
WS:SH:FS (25:50:25 %)	7–8	20–21	29–30*
WS:SH:FS (25:25:50 %)	5–6	17–18	20–21*

No significant difference in the morphology of the obtained fruiting bodies of fungi on these substrates was found.

According to the results of our research, we found that irradiation of the mycelium with light at a wavelength of 532 nm accelerated the fouling of the substrate from wheat straw decreased by 6 days. For other substrates (except wheat straw (100%)) this period was reduced by 3-4 days. During the study of the process of primordial formation and the beginning of fruiting, the acceleration of these processes by 4–5 days was found. For mycelium cultivated on a substrate of wheat straw under the action of laser irradiation, the process of primordia formation and the beginning of fruiting was reduced by 1-2 days.

Given the above relationship between the photoinduction activity of fungi and their metabolism, it can be assumed that the chemical composition of different types of cellulose-containing substrates can affect the degree of changes in the intensity of growth of *P. ostreatus*, which are caused by light. Because according to the literature on the amount of N in the cellulose-containing substrates we used, the most bound N contains a substrate of flower scales of corn origin, followed by a substrate of sunflower husk and the least amount of N in a substrate of wheat straw. Accordingly, the growth parameters of *P. ostreatus* when cultivated on these substrates increased in proportion to the amount of N in the substrates used. And the use of irradiation of the mycelium with green light with a wavelength of 532 nm in turn also contributed to the stimulation of growth parameters of *P. ostreatus*.

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