

Comparison of the mycelium growth of selected strains and crossbred cultures of *Lentinula edodes* (Berk.) Sing. cultivated on different substrates

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Summary

The objective of the performed investigations was to compare mycelium growth of eighteen strains and two crossbred cultures of *Lentinula edodes* cultivated on agar media and on sawdust substrates from deciduous trees. On the basis of the performed experiments it is possible to conclude that the mycelium growth rate was a characteristic feature of the examined strains and crossbred cultures of *L. edodes*, although it depended on the type of the substrate on which it was growing.

Key words: *Lentinula edodes*, strains, crossbred cultures, mycelium growth, substrates

INTRODUCTION

Lentinula edodes (Berk.) Sing. belongs to cultivated mushrooms produced on a large scale [1]. Attempts are being continually made to find strains which would be characterized by a dynamic mycelium growth and high yields. Hence, results of numerous comparative investigations of *L. edodes* strains have been published [2-4]. During the recent decade, a huge progress has been made in the cultivation of new strains, among others, due to the application of crossings between single-spore cultures [5]. *L. edodes* strains show a considerable diversity with regard to the mycelium growth dynamics as well as the yielding course and size [6, 7].

The objective of the performed investigations was to compare mycelium growth of eighteen strains and two crossbred cultures of *L. edodes* cultivated on agar media and on a substrate prepared from the sawdust derived from deciduous trees.

MATERIAL AND METHOD

The object of the performed experiments comprised the following strains and crossbred cultures of *L. edodes*: 37X37 and MS-20 (Lambert, USA), CS41, CS53, CS287, CS260, CS274, CS290, CS323, CS333 (MNC collection – USA), 4055 and 4080 (Sylvan Company), M465 and M290 (Mori, Japan), A6, A567, A580 (Akiyama, Japan), Hokken 600 (Hokken, Japan), SH27/2xSH27/7 and SH20/5xSH20/11 (crossbred cultures obtained at the Department of Vegetable Crops).

Mycelium growth of strains and crossbred cultures of *L. edodes* was investigated in two stages. During the first stage, mycelium growth was compared on agar media: wheat medium and a medium prepared in accordance with Hansen. The composition and method of media preparation was described by Ziombra et al. [8]. Experiments were established on Petri dishes (9 cm in diameter). Four millimeter in diameter discs of agar overgrown with the mycelium of the examined strains were placed in the central dish point of the medium and incubation was carried out at the temperature of 25°C for the period of 7 days. The measure of mycelium growth was the diameter of the medium taken up by hyphae.

In the course of the second stage, growth of mycelium was compared on the substrate prepared from oak and birch sawdust. The experimental sawdust was enriched with wheat bran in the amount of 25% in relation to sawdust dry matter and then moistened with tap water to the moisture content of 60%. These experiments were carried out in glass test tubes. Detailed description of substrate preparation as well as the method of inoculation with the appropriate mycelium and incubation conditions was discussed by Siwulski [9]. The measure of mycelium growth was the thickness of the substrate layer overgrown with hyphae following 14 days of incubation.

In both stages, the experiments were designed as a random design, two factorial trial in 10 replications and two series. Experimental results were compared by the analysis of variance for factorial experiments. Duncan's test at a level of significance $\alpha=0.05$ was applied. The obtained results were discussed on the basis of mean values of two series.

RESULTS AND DISCUSSION

The experimental strains and crossbred cultures of the *L. edodes* varied significantly with regard to mycelium growth on agar media (fig. 1). It was found that the mycelium of the examined strains and crossbred cultures grew better on the wheat agar medium than on the medium prepared according to Hansen. The diameter of mycelium colony on the wheat medium was on average by 22.2% bigger than on the Hansen's one after 7 days of incubation. The fastest mycelium growth on wheat agar medium was recorded in the case of the A 567 strain and the SH27/2xSH27/7 crossbred culture, whereas on the Hansen medium – the M465

strain and the above-mentioned crossbred culture. The worst mycelium growth, irrespective of the type of the applied agar medium, was observed in the case of the A580 strain. Earlier, also Raaska [10] and Royse [11] as well as Fung et al. [12] reported differences in the rate of mycelium growth of various strains of *L. edodes*.

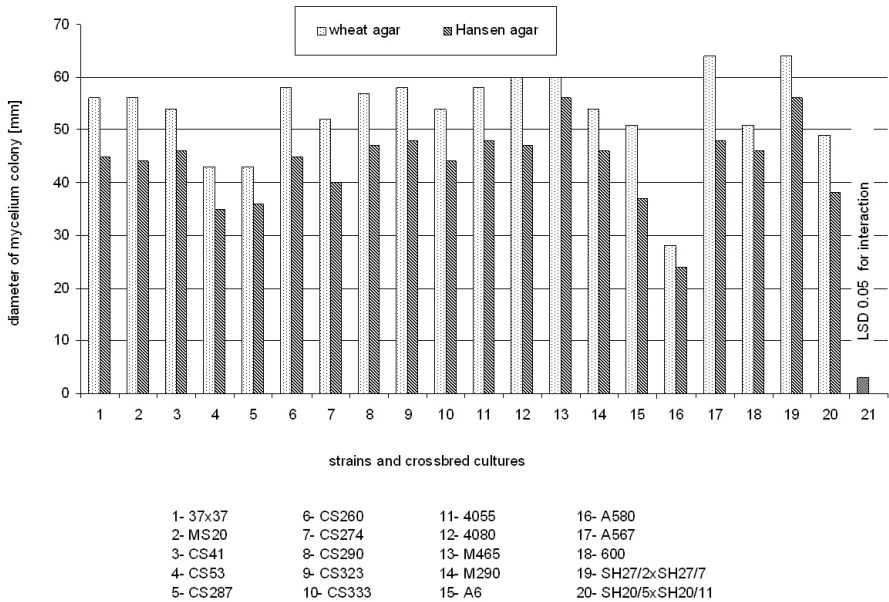


Figure 1. Mycelium growth of twenty *Lentinula edodes* strains on the two agar media

Also in the case of the employed sawdust substrates, differences in the mycelium growth among the examined strains and crossbred cultures of *L. edodes* were recorded (fig. 2). However, this time only the above-mentioned SH27/2xSH27/7 crossbred culture exhibited the fastest growth on sawdust substrates, as was the case with agar media. It was found that there was no similar tendency among the examined strains and crossbred cultures for an equally rapid growth on agar media and sawdust substrates. Mycelium of all tested strains and crossbred cultures grew better on the substrates prepared from oak sawdust than on those from birch sawdust. The only exception was the CS260 strain which mycelium grew similarly on both sawdusts. Substrate layer occupied by mycelium was on average by 13.4% thicker in the case of oak sawdust in comparison with birch sawdust. Rapid mycelium growth on the cultivation medium reduces the risk of contamination with competitive microorganisms and, therefore, this trait is a very desirable character in mushroom cultivation [13]. According to Shulga [14], some strains of *L. edodes*, which are characterized by rapid mycelium growth, exhibit resistance to infection by fungi from the *Trichoderma* genus.

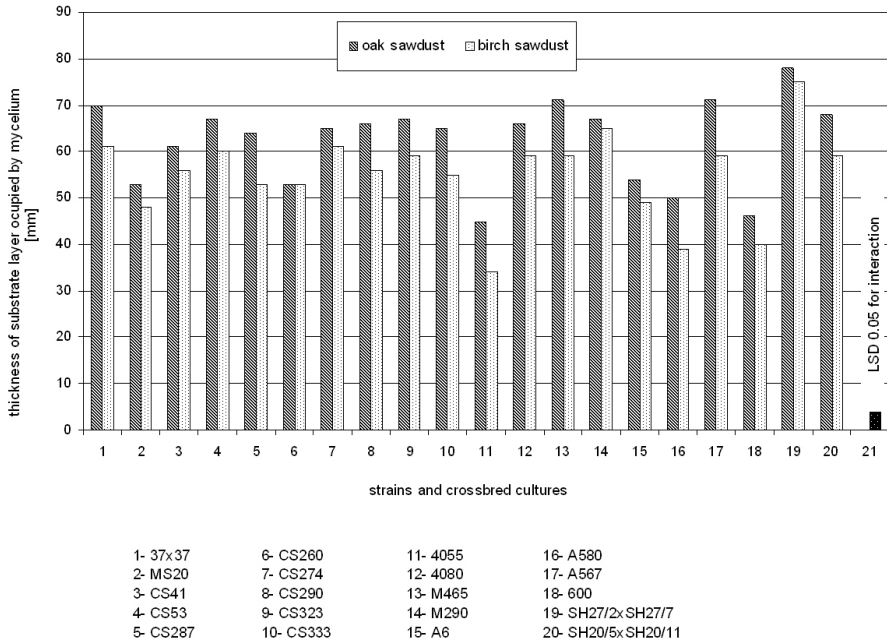


Figure 2. Mycelium growth of twenty *Lentinula edodes* strains on the two sawdust substrates

CONCLUSIONS

On the basis of the performed experiments it is possible to conclude that the mycelium growth rate was a characteristic feature of the examined strains and crossbred cultures of *L. edodes*, although it depended on the type of the substrate on which it was growing.

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REFERENCES

1. Chang ST. Witnessing the development of mushroom industry in China. *Acta Edulis Fungi* 2005; 12 (suppl.): 3-19.
2. Fukuda M, Mori Y. Genetic differences in wild strains of *Lentinula edodes* collected from a single fallen tree. *Mycosci* 2003; 44:365-8.
3. Gan BC, Tang JR, Peng WH, Guo Y, Xie LY, Xiao ZQ. Study on the breeding of strains from protoplast monokaryon cross in *Lentinula edodes*. *Southwest China J Agric Sci* 2006; 19:494-7.

4. Zhang R, Huang Ch, Zheng S, Zhang J, Tzi Bun Ng, Jiang R, Zuo X, Wang H. Strain-typing of *Lentinula edodes* in China with inter simple sequence repeat markers. *Appl Microbiol Biotechnol* 2007; 74:140-5.
5. Fan L, Pan H, Soccol AT, Pandey A, Soccol CR. Advances in Mushroom Research in the Last Decade. *Food Technol Biotechnol* 2006; 44(3):303-11.
6. Siwulski M, Sobieralski K. Porównanie plonowania wybranych odmian produkcyjnych i krzyżówek shiitake (*Lentinus edodes* Berk. Sing). *Ann Univer Mariae Curie-Skłodowska* 2000; 8:465-9.
7. Sobieralski K, Siwulski M, Grzebielucha I, Nowak M. Wpływ rodzaju podłoża na wzrost i długość okresu dojrzewania grzybni oraz plon twardziaka jadalnego (*Lentinula edodes* (Berk.) Pegler). *Zesz Probl Post Nauk Rol* 2007; 517:695-703.
8. Ziombra M, Gapiński M, Siwulski M. Wzrost grzybni pieczarki, bocznika, twardziaka i pierścieniaka na różnych pożywkach. *Roczn AR Pozn* 1991; CCXXV:181-7.
9. Siwulski M. Wpływ niektórych czynników na wzrost grzybni i plonowanie twardziaka jadalnego - *Lentinula edodes* (Berk.) Sing. *Roczn AR Pozn Rozp Nauk* 2005; 358:83.
10. Raaska L. The growth and productivity of six shiitake (*Lentinula edodes*) strains on supplemented sawdust medium. *Material und Organismen* 1990; 25(1):47-61.
11. Royse DJ. Cultivation of shiitake on natural and synthetic logs. *Penn. State Univ.* 2001:12.
12. Fung YW, Fung TW, Franco M. Evaluation of different colombian agroindustrial wastes as substrates for growth and production of *Lentinula edodes* Berk. Pegler (Shiitake). *Acta Edulis Fungi* 2005; 12 (suppl.):285-90.
13. Oei P. Mushroom cultivation, appropriate technology for mushroom growers. *Leiden* 2003:429.
14. Shulga OV. Types of interaction between *Lentinula edodes* (*Agaricales*) and *Trichoderma* species ("Green molds") on malt extract agar medium. *Acta Edulis Fungi* 2005; 12 (suppl.):383-9.

PORÓWNANIE WZROSTU GRZYBNI WYBRANYCH ODMIAN I KULTUR KRZYŻÓWKOWYCH TWARDZIAKA JADALNEGO *LENTINULA EDODES* (BERK.) SING. NA RÓŻNYCH PODŁOŻACH

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Streszczenie

Porównano wzrost grzybni osiemnastu odmian i dwóch kultur krzyżówkowych twardziaka jadalnego (*Lentinula edodes*) na pożywkach agarowych i na podłożach z trocin drzew liściastych. W wyniku przeprowadzonych doświadczeń stwierdzono, że szybkość wzrostu grzybni była cechą charakterystyczną dla badanych odmian i kultur krzyżówkowych twardziaka jadalnego, ale zależała od rodzaju podłoża, na jakim grzybnia się rozwijała.

Słowa kluczowe: *Lentinula edodes*, odmiany, kultury krzyżówkowe, wzrost grzybni, podłoża