Effect of the leaf extract from the maidenhair tree (*Ginkgo biloba* L.) on the growth of the oyster mushroom (*Pleurotus* spp.) mycelium

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S u m m a r y

The authors investigated the impact of maidenhair alcohol extract addition on mycelium growth in two species of oyster mushroom: *P. precoce* and *P. citrinopileatus* on the agar medium and beech sawdust substrate. The following concentrations of the experimental extract were added to media and substrates: 0, 1, 10, 100, 1000 and 10000 μg/l.
It was found that addition of extract from maidenhair leaves to agar medium either stimulated or inhibited the mycelium growth of oyster mushroom depending on extract concentration. In case of the *P. precoce*, stimulation of mycelium growth occurred at extract concentration of 1 and 10 μg/l, while in *P. citrinopileatus* – at concentration ranging from 1 to 100 μg/l. Concentrations higher than those mentioned above inhibited the growth of mycelium.
The extract from maidenhair leaves added to substrate from beech sawdust was found to stimulate mycelium growth only at concentration of 10000 μg/l, irrespective of species of the examined oyster mushroom.

Key words: Pleurotus, mycelium growth, extract, Ginkgo biloba

A rapid growth of mycelium is a desirable trait of mushrooms growing in intensive systems, which indicate its strong vitality and allows to shorten the time necessary to take the control of the substrate by hyphae. Moreover, it reduces risk of infestation of the culture by competitive microorganisms and leads to earlier yielding.

A number of researchers maintain that growth of mycelium of cultivated mushrooms can be speeded up by addition extracts or various substances acting to the substrate of plant or peat as growth regulators [1-5].

At present, much attention is focused on chemical compounds which occur in leaves of maidenhair tree – *Ginkgo biloba* L. Extracts prepared from leaves of this tree species are rich in biologically active substances [6]. They are applied primarily in medicine but also are frequently employed as plant protection agents [7, 8].

The objective of performed investigations was to assess the effect of application of alcohol extract from leaves of maidenhair on the growth of oyster mushroom mycelium on agar medium in liquid culture and on a substrate from beech sawdust.

MATERIAL AND METHODS

Investigations were carried out in 2005 in the biological laboratory of Department of Vegetable Crops of the August Cieszkowski Agricultural University in Poznań.

The object of performed experiments was mycelium of two species of the oyster mushroom: *Pleurotus precoce* (Fr.) Quel and *Pleurotus citrinopileatus* Sing. The growth of mycelium was analysed on agar medium and on sawdust substrate. The agar medium was prepared from wheat grain stock. The grain in amount of 100 g was boiled in 1 dm^3 distilled water for 1 h and then separated from the stock. Next 20 g of agar was added and completed with distilled water to the volume of 1 l. The substrate from beech sawdust was supplemented with 20% addition of wheat bran in relation to dry matter. The substrate was moistened with distilled water to the moisture content of 65%. Alcohol extract of maidenhair tree leaves was added to both the agar medium and sawdust substrate at following concentrations: 0, 1, 10, 100, 1000 and 10000 μg/l. The extract was prepared from 100 g of fresh leaves without petioles which were immersed in 425 g of 70% ethyl alcohol and left to macerate for 3 month. Both agar medium and sawdust substrate were sterilised in autoclave at the temperature of 121°C for 30 min. The growth of mycelium on agar medium was investigated on Petri dishes of 9 cm diameter, whereas its growth on the sawdust substrate – in bacteriological test tubes of 1.5 cm diameter and length of 16 cm. In the experiments on Petri dishes media were inoculated with agar disks of 5 mm diameter covered with mycelium hyphae of examined species of oyster mushroom, while sawdust substrates in test tubes were inoculated by grain mycelium on wheat grains. In both cases, the incubation process was conducted at temperature of 25°C and air relative humidity of 80–85% without access to light. The diameter of the mycelium colony on the agar medium was measured after 7 days of incubation, whereas the measurement of the mycelium growth on the sawdust substrate was carried out after 14 days of incubation. The measure of growth was thickness of substrate layer overgrown with hyphae.

The experiment was conducted in completely independent design in 10 replications for agar medium and in 6 replications for sawdust substrate.

RESULTS AND DISCUSSION

It was found that addition of extract prepared from maidenhair leaves to the agar medium either stimulated or inhibited the growth of the mycelium, depending on its concentration (Fig. 1). Addition of maidenhair extract at concentration of 1 and 10 μg/l significantly accelerated growth of *P. precoce* mycelium. Addition of extract concentrations of 100 μg/l and higher inhibited the mycelium growth of this species. Rate of mycelium growth decreased with increase of extract concentration. In the case of *P. citrinopileatus* species stimulation of mycelium growth occurred at the extract concentrations of 1, 10 and 100 μg/l, while the inhibiting effect was observed only in the highest concentration.

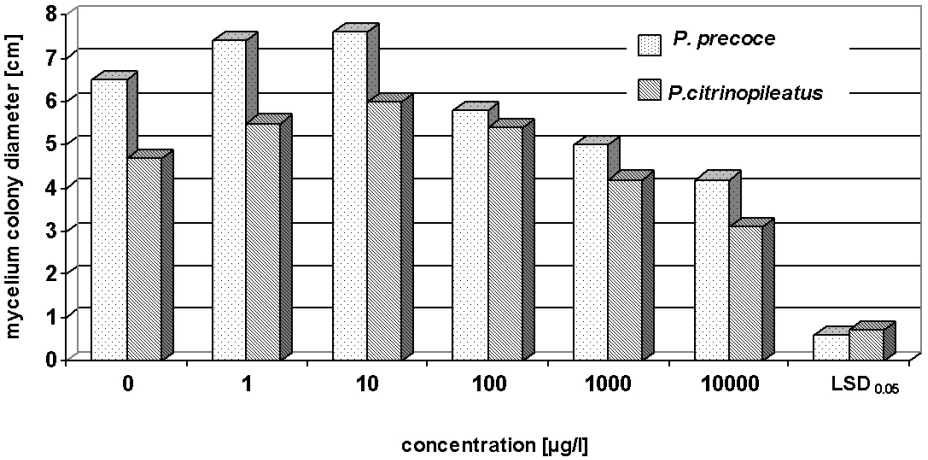

Fig. 1. Impact of alcohol extract from *Ginkgo biloba* leaves on mycelium growth in two species of *Pleurotus* on agar medium.

Different results of investigations were reported by Gapiński et al. [9]. In their experiments, they investigated, among others, the effect of alcohol extract of maidenhair leaves at following concentrations: 0.1, 1, 10, 100 and 1000 μg/l on the growth of *Agaricus bisporus* (Lange) Sing. and *Pleurotus ostreatus* (Fr.) Kumm. They found that the growth rate of *P. ostreatus* mycelium was inhibited in case of all applied extract concentrations. On the other hand, in *A. bisporus* species, addition of experimental extract inhibited the growth of mycelium only when applied concentrations ranged from 0.1 to 100 μg/l, whereas at the concentration of 1000 μg/l the extract exerted a stimulating effect. Differences in obtained research results could have resulted from specific response of examined mushroom species to the presence of the maidenhair extract in substrates.

In authors' own experiments on the substrate from beech sawdust, a stimulatory impact of the addition of maidenhair extract on the mycelium growth occurred only when the highest concentration (i.e. 10 000 μg/l) was employed, irrespective

of the species of the oyster mushroom. On the other hand, in case of extract concentrations ranging from 1 to 1000 μg/l, mycelium of the examined species increased similarly to mycelium on the substrate without addition of the experimental extract (Fig. 2).

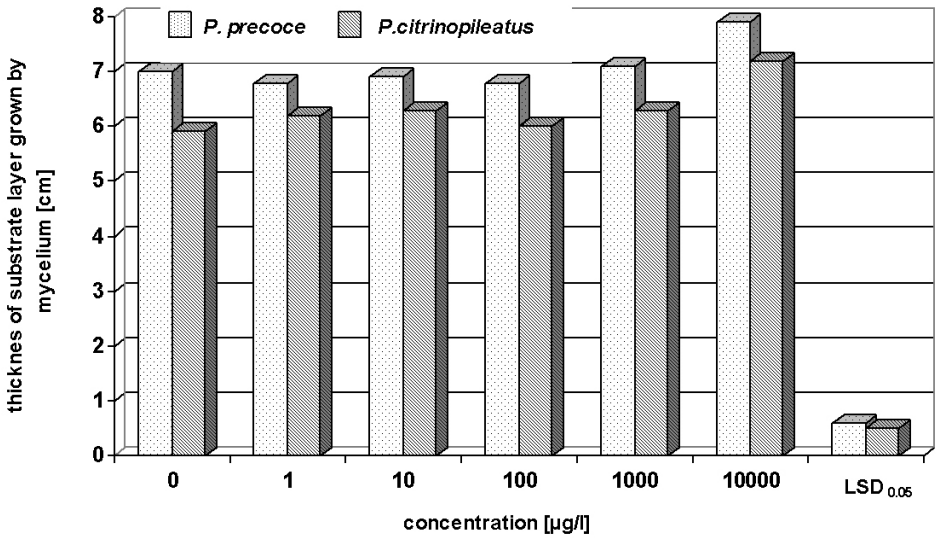

Fig. 2. Impact of alcohol extract from *Ginkgo biloba* leaves on mycelium growth in two species of *Pleurotus* on beech sawdust substrate.

CONCLUSIONS

1. The addition of extract from maidenhair leaves to agar medium either stimulated or inhibited the growth of mycelium depending on its concentration and species of the examined oyster mushroom.
2. The extract from maidenhair leaves added to beech sawdust stimulated the growth of mycelium only when its concentration was 10000 μg/l, irrespective of examined oyster mushroom species.

REFERENCES

1. Kalbarczyk J. Wpływ kwasów huminowych dodawanych do pożywki agarowej na rozwój grzybni wybranych gatunków grzybów jadalnych. Zesz Nauk AR Szczecin 1984; 2:215-26.
2. Otta H, Wójcik P. Miłorząb dwuklapowy (*Ginkgo biloba* L.) w terapii. Roczn Dendrol 1998; 46:147-54.
3. Siwulski M. Wpływ gibereliny GA3 i BCH na wzrost grzybni twardziaka shii-take. Zesz Nauk AR Bydgoszcz, Roln 1998; 215:227-30.
4. Siwulski M, Sobieralski K. Wpływ wybranych regulatorów wzrostu na plonowanie twardziaka shii-take. Roczn AR Poznań, Ogrodn 1998; 27:285-91.

5. Vinklarkova K, Sladky Z. Exogenous regulators in the mycelium of *Pleurotus ostreatus* after exogenous application. Folia Microbiol 1978; 23:55-9.
6. Ohga S. The effect of administration of growth activating substances on the cultivation of shii-take mushroom, *Lentinus edodes*. Bull Kyushu Univ For 1989; 61:1-90.
7. Fu-Shun Y, Evans KA, Stevens LH, van Beek TA, Schoonhoven LM. Deterrens extracted from the leaves of *Gingko biloba* effects on feeding and contact chemoreceptors. Entomol Exper Applic 1990; 54, 1:57-64.
8. Grzybek J. Farmakologiczna charakterystyka miłorzębu japońskiego. Wiad Zielar 1992, 6:11-12.
9. Gapiński M, Woźniak W, Korszun S, Mazela A. Wpływ preparatów z miłorzębu dwuklapowego (*Ginkgo biloba* L.) na wzrost strzępek grzybni pieczarki [*Agaricus bisporus* (Lange) Sing.], boczniaka [*Pleurotus ostreatus* (Fr.) Kumm.] i twardziaka [*Lentinula edodes* (Berk.) Sing.]. Roczn Dendrol 1998; 46:159-66.

WPŁYW WYCIĄGU Z LIŚCI MIŁORZĘBU DWUKLAPOWEGO (*GINKGO BILOBA* L.) NA WZROST GRZYBNI BOCZNIAKA (*PLEUROTUS* SPP.)

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S t r e s z c z e n i e

Badano wpływ wyciągu alkoholowego z zielonych liści miłorzębu dwuklapowego na wzrost grzybni dwóch gatunków boczniaka, tj. *P. precoce* i *P. citrinopileatus* na pożywce agarowej i podłożu z trocin bukowych. Do pożywek i podłoży zastosowano dodatek wyciągu w stężeniu 0, 1, 10, 100, 1000 i 10000 μg/l.
Stwierdzono, że dodatek wyciągu z miłorzębu do pożywki agarowej stymulował bądź hamował wzrost grzybni boczniaka w zależności od stężenia. U *P. precoce* stymulacja wzrostu grzybni wystąpiła przy stężeniu wyciągu 1 i 10 μg/l, a u *P. citrinopileatus* od 1 do 100 μg/l. Stężenia wyciągu wyższe od wymienionych hamowały wzrost grzybni.
Wyciąg z miłorzębu dwuklapowego dodany do podłoża z trocin bukowych działał stymulująco na wzrost grzybni jedynie w stężeniu 10000 μg/l, niezależnie od badanego gatunku boczniaka.

Słowa kluczowe: boczniak, wzrost grzybni, ekstrakt, miłorząb dwuklapowy