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THE RANGE OF TROPHIC PREFERENCES OF OAK MAZEGILL (*DAEDALEA QUERCINA* (L.): FR.) ISOLATE EXAMINED *IN VITRO*[*]

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Abstract. The mycelium isolate of *Daedalea quercina* (L.): Fr. was examined *in vitro* according to its ability to wood decay of 25 tree species both European, introduced and exotic, not existing in our geographical latitude. The range of trophic preferences of this fungus was defined and the speed of wood decay of individual tree species was investigated.

Key words: Oak Mazegill, *Daedalea quercina*, trophic preferences, wood decay

INTRODUCTION

Oak Mazegill (*Daedalea quercina* (L.): Fr.) is a common both parasitic and saprobic fungus decaying wood of forest trees. It occurs in nearly all European countries following the geographic range of different oak species. It is also found in Northern Africa (Marocco, Tunisia), Asia from Caucasus to India and even in Australia [Kotlaba 1984]. It causes massive brown pattern of wood decay often leading to huge wood losses inside the stems and branches of old, strongly attacked trees [Grzywacz 1990]. It affects mostly oaks – according to Kotlaba [1984] they are 98% of its hosts in the middle Europe. Except of oaks Oak Mazegill occasionally attacks many other tree species mostly from genus (in alphabetical order): *Acer*, *Castanea*, *Corylus*, *Eucalyptus*, *Fagus*, *Fraxinus*, *Juglans*, *Populus*, *Prunus*, *Sorbus*, *Tilia* i *Ulmus* [Ryvarden and Gilbertson 1993], *Alnus*, *Gleditsia* and *Salix* [Kotlaba 1984].

As it has been written above the range of hosts of *Dedalea quercina in vivo* is already well investigated and described. But it is only a little known about its trophic preferences *in vitro*. So, the main point of these investigation was to define the group of tree species with wood able to be decayed by *Dadalea quercina* in laboratory conditions and to estimate the speed of this process.

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MATERIALS AND METHODS

The mycelium of *Daedalea quercina* which was necessary for the experiment was collected in the stands of the Radziwiłłów Forest District (central Poland). As experimental materials the wood of 25 tree species was used including 16 species of European or introduced trees and 9 species of exotic trees not existing in our climate. The first group gathered contained: European silver (*Abies alba* Mill.), sycamore maple (*Acer platanoides* L.), European alder (*Alnus glutinosa* Gaertn.), white birch (*Betula pendula* Roth.), European hornbeam (*Carpinus betulus* L.), red beech (*Fagus silvatica* L.), European ash (*Fraxinus excelsior* L.), European larch (*Larix decidua* Mill.), Norway spruce (*Picea abies* Karst.), Scots pine (*Pinus silvestris* L.), common aspen (*Populus tremula* L.), English oak (*Quercus robur* L.), northern red oak (*Quercus rubra* L.), crack willow (*Salix fragilis* L.), small-leaved lime (*Tilia cordata* Mill.) and field elm (*Ulmus carpinifolia* Gleditsch). The second group consisted of: okoumé (*Aucoumea klaineana* Pierre), iroko (*Chlorophora excelsa* Benth. & Hook), yatoba (*Hymnaea sp.*), merbau (*Intsia bakeri* Prain), wenge (*Millettia laurentii* De Wild.), badi (*Nauclea trillesii* Merill), padouk (*Pterocarpus soyauxii* Taubert), ipe (*Tabebuja sp.*) and samba (*Triplochiton scleroxylon* K. Schum.). From carefully stored wood of all these tree species the experimental samples were made. The size of each sample was 50×25×15 mm.

The research of speed of wood decay was made according to present rules enclosed in Polish norm [PN-EN 113: 1993/A2 1993]. Every sample was precisely measured using slide callipter exact to a 0.1 mm and then its dimension was calculated. After measuring samples were dried during 72 h in electric drying apparatus at the temperature of 105ºC to the absolutely dry shape. Immediately after putting out they were weighed on the laboratory scales with precision of 0.001 g and then their densities were calculated. To the experiment were qualified only samples with similar value of this characteristic (samples of widely differed density were discarded).

To sterile (autoclaving in temperature of 121ºC for 30 min) Weck's glass pots 20 ml of agar-maltose-wort medium (composition: Difco's agar – 20 g, Difco's maltose extract – 15 g, distilled water – 750 ml, wort – 250 ml) was poured. The wort used in all experiments came from the Jabłonowo Brewery and was collected from the same part, which means the medium could be recognized as standardized. After 24 hours inoculates of *Daedalea quercina* were grafted. Flasks were then clogged and put in the incubator at the temperature of 21ºC. After another fourteen days in every flask on the growing hyphae two wood samples placed on glass rests were put. Before placing all the samples were sterilized using radiation method. The sterilization was made at the Warsaw Institute of Nuclear Chemistry and Technology. The glass rests were used to eliminate the risk of medium water absorption by wood samples, which could be the reason of incorrect result's interpretation. Then all flasks were once again put into the incubator. All laboratory activities (flask's opening, inoculate's grafting, sample's putting) were performed in closed, hermetic chamber sterilized by UV-lamps. Every tool (lancets, pincers, needles, etc.) was sterilized firstly in thermal sterilizer (200ºC) and secondary in 95% solution of ethyl alcohol. The samples were exposed to fungi activity for 30, 60 or 90 days. For every variant of the experiment (different wood species and times of exposition) 6 samples put in 3 flasks were examined. After assumed time every sample was put out and once again dried and weighed. The loss of weight between first and second weighing showed the extent of wood decayed in every sample. In this way the

efficiency of wood decay by *Daedalea quercina* against every testing wood species was shown. Then it was described proportionally using the following formula:

$$\Delta = [(G_0 - G_1) / G_0] \cdot 100, \%$$

where:

Δ – percentage sample's weight's loss,
G_0 – weight of sample before the experiment, g,
G_1 – weight of sample after the experiment, g.

Totally, in all experiments 450 wooden samples put in 225 pots were used. On the basis of one-way anova and multiple range test (LSD method) the differences among 25 individual tree species were tested in wood weight's loss. It was carried out separately for 30, 60, 90 days of mycelium exposition. The analyses were carried out at the 95% confidence level.

RESULTS AND DISCUSSION

For every result of every variant of the experiment (species of tree and time of exposition) the medium value was calculated and shown in Tables 1 and 2.

Table 1. The weight loss of wood samples of European and introduced tree species tested on the mycelium of *Daedalea quercina* after 30, 60 and 90 days of exposition presented as a medium percentage
Tabela 1. Średni procentowy ubytek masy próbek drewna poszczególnych gatunków drzew krajowych i introdukowanych testowanych na grzybni *Daedalea quercina* po 30, 60 i 90 dniach ekspozycji

Species of tree Gatunek drzewa	Time of exposition – Czas ekspozycji		
	30 days – 30 dni	60 days – 60 dni	90 days – 90 dni
Abies alba	0.80	1.67	2.70
Acer platanoides	2.03	9.85	11.08
Alnus glutinosa	0.08	4.32	4.46
Betula pendula	0.30	1.85	19.77
Carpinus betulus	2.95	2.99	3.10
Fagus silvatica	0.08	0.11	0.15
Fraxinus excelsior	0.14	0.36	5.18
Larix decidua	0.61	0.73	0.83
Picea abies	1.58	13.85	14.82
Pinus silvestris	0.15	0.44	0.52
Populus tremula	1.43	14.87	19.80
Quercus robur	0.16	0.24	0.75
Quercus rubra	2.10	2.94	4.36
Salix fragilis	0.51	13.89	17.27
Tilia cordata	0.14	2.58	4.04
Ulmus carpinifolia	0.27	0.39	0.63

Table 2. The weight loss of wood samples of exotic tree species tested on the mycelium of *Daedalea quercina* after 30, 60 and 90 days of exposition presented as a medium percentage
Tabela 2. Średni procentowy ubytek masy próbek drewna poszczególnych gatunków drzew egzotycznych testowanych na grzybni *Daedalea quercina* po 30, 60 i 90 dniach ekspozycji

Species of tree Gatunek drzewa	Time of exposition Czas ekspozycji		
	30 days – 30 dni	60 days – 60 dni	90 days – 90 dni
Aucoumea klaineana	0.24	2.51	3.21
Chlorophora excelsa	0.02	0.03	0.04
Hymnaea sp.	0.02	0.06	0.14
Intsia bakeri	0.04	0.05	0.10
Millettia laurentii	0.03	0.09	0.11
Nauclea trillesii	0.18	0.32	0.34
Pterocarpus soyauxii	0.05	0.06	0.09
Tabebuja spp.	1.45	1.47	1.48
Triplochiton scleroxylon	0.09	0.78	0.91

Among European and introduced tree species after 30 days of exposition the highest level of wood's decomposition was observed in case of *Carpinus betulus* (2.95%), *Quercus rubra* (2.10%) and *Acer platanoides* (2.03%), and the lowest – in case of *Alnus glutinosa* (0.08%), *Fagus silvatica* (0.08%), *Fraxinus exelcior* (0.14%) and *Tilia cordata* (0.14%). After 60 days exposition period the strongest decay was found on *Populus tremula* (14.87%), *Salix fragilis* (13.89%) and *Picea abies* (13.85%), and the smallest on *Fagus silvatica* (0.11%), *Quercus robur* (0.24%) and *Fraxinus excelsior* (0.36%). After 90 days of exposition the highest level of decomposition was measured on *Populus tremula* (19.80%), *Betula pendula* (19.77%) and *Salix fragilis* (19.27%) wood samples, and the lowest – in case of *Fagus silvatica* (0.15%), *Pinus silvestris* (0.52%) and *Ulmus carpinifolia* (0.63%).

Among exotic trees after 30 days of exposition to mycelium of *Daedalea quercina* the highest decay was observed on *Tabebuja sp.* wood samples (1.45%), and the smallest on *Chlorophora excelsa* and *Hymnaea sp.* wood samples (both 0.02%). After 60 days of the exposition period its highest level was found in case of *Aucoumea klaineana* (2.51%), and the lowest – in case of *Chlorophora excelsa* (0.03%). The same situation was after 90-day period of exposition – the biggest weight's loss was investigated on *Aucoumea klaineana* (3.21%), and the smallest in case of *Chlorophora excelsa* wood samples (0.4%).

It is hard to find any results of similar *Daedalea quercina* researches in already published scientific works. However, comparing its trophic abilities and the speed of wood decay it is obvious that this fungus belongs to species with rather small range of trophic preferences and low rate of wood decomposition. On both these fields without any competition are so called 'home-fungi' represented by *Serpula lacrymans* (Wulf., Fr.) Schroet and *Coniophora puteana* (Schum., Fr.) Karst. According to the published data they are able to decay the wood of all known tree species [Krajewski and Witomski

2003] causing in laboratory conditions the weight loss even to 45-50% of dry sample mass after 180 days of exposition [Ochrona... 2001]. On the other hand, *Daedalea quercina* has a much wider range of trophic abilities and is able to decay wood much faster than other monophagic fungi. The good example could be *Fomitopsis officinalis* (Vill.: Fr.) Bondarcev et Singer) which is able to decay mostly only larch wood and causing its weight loss of no more than 6.57-10.19% after 90 days of exposition [Piętka 2004].

CONCLUSIONS

1. The range of trophic preferences of *Daedalea quercina* examined *in vitro* is much wider than *in vivo*.

2. The mycelium of *Daedalea quercina* raised *in vitro* is able to decay the wood of the majority of European broadleaved trees examined in this research.

3. The range of wood decay of particular tree species differs a lot and it seems to be correlated with the density of their wood – the positively fastest decomposition was observed in case of samples made from wood of low density like *Populus tremula*, *Salix fragilis* and *Betula pendula*.

4. The mycelium of *Daedalea quercina* is able to decay *in vitro* also the wood of European trees that have never been its hosts *in vivo*, eg. some species of coniferous trees like *Picea abies* (14.82% of medium weight loss after 90 days of exposition).

5. The mycelium of *Daedalea quercina* is able to decay *in vitro* the wood of some exotic tree species living only after natural geographical range of its existing.

6. In laboratory conditions the wood of oaks – the main natural hosts of *Daedalea quercina* – is decayed by the mycelium of this fungus relatively slow, and in case of *Quercus rubra* wood the process comes much faster comparatively to *Quercus robur*.

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ZAKRES PREFERENCJI TROFICZNYCH DREWNA IZOLATU GMATWKA DĘBOWEGO (*DAEDALEA QUERCINA* (L.): FR.) BADANY *IN VITRO*

Streszczenie. Grzybnia *Daedalea quercina* (L.): Fr. została przebadana *in vitro* pod kątem jej zdolności do rozkładu drewna 25 gatunków drzew krajowych, introdukowanych i egzotycznych. Określono laboratoryjnie zakres preferencji troficznych tego gatunku grzyba oraz oceniono tempo rozkładania przez niego próbek drewna poszczególnych gatunków drzew.

Słowa kluczowe: gmatwek dębowy, *Daedalea quercina*, preferencje troficzne, rozkład drewna

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