Diversity and ecology of polypores in urban vegetation of northern, central and southern Slovakia

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Abstract

During the years 2010–2011, we recorded 102 findings of polypores including 20 taxa in three different kinds of urban vegetation of northern, central and southern Slovakia. The most abundant taxa were *Phellinus igniarius* s. l. (16 findings) and *Fomes fomentarius* (L.) J. J. Kickx (11 findings). There was also a broad range of the host plants (15 genera, 22 species). The most abundant species of the host plants were *Acer platanoides* L. (12%), *Cerasus serrulata* (Lindl.) Loudon (11%) and *Salix × sepulcralis ‘Tristis’* (10%). 53% of polypores colonized stem, fewer of them (21%) colonized branches. We observed the polypores in the town parks, street lines (alleys) and streamside stands. City parks and alleys were the most often habitats of polypore occurrences.

Keywords
diversity, ecology, host plant, polypore, urban vegetation

Introduction

Wood-destroying fungi represent serious problems in urban conditions. They are causing wood rots of infected woody plants and they have an unfavorable influence not only on the health of hosts but also on their aesthetic appeal. Although their harmful activity in the association with trees and shrubs has been studied extensively, relatively few specific studies have been conducted on the urban mycoflora in Europe (TELLO et al., 2005). SUPUKA et al. (1991) mention that parasitic mycoflora of urban areas is very various. The fungi are getting in this environment from forest nursery, surrounding forest stand, orchards and gardens. From there they are transferred by the wind, the insects, by the rain, and very often by human on the woody plants, which are grown for improvement of environment. There are number of factors which influence polypore spreading. Overall, there are biotic and abiotic agents, for example TAKEMOTO et al. (2010) indicate unfavourable weather conditions (drought, heat, low temperatures, overhumidity, ongoing global warming). SINCLAIR et al. (1987) also stated that the fungus might aggressively colonize trees stressed by heat and drought. Similarly, SCHWARZE et al. (2000) also consider that weather conditions such as humidity, temperature fluctuations, and UV radiations definitely cause degradation of wood after a certain time. Concerning abiotic factors, there are some examples of fungal spreadings – traffic, industries, incorrect tree maintenance, construction work near trees, and deliberate man-made injuries. Furthermore, BALDER (1994) revealed nitrogen enrichment in the subsoil caused by dog urine in urban situation. He considered that high nitrogen contents in the wood can lead to higher rates of degradation by fungi, or cause increased disposition for decay. In
Slovakia, predominantly GáPer with his co-workers (GáPER, 1996; 1998; 2001; 2002; 2003a; 2003b; GáPER and GáPERová, 1999; GáPer and REPÁC, 2003) are concerned with diversity and distribution of polypores and wood-decaying fungi in urban areas. TELLO et al. (2005) state that polypores such as Bjerkandera adusta (Willd.) P. Karst., Fomes fomentarius (L.) J. J. Kickx, Phellinus igniarius s. l., Trametes versicolor (L.) Pilát and some others are always common in urban areas if the appropriate host is present. Furthermore, TELLO et al. (2005) state that species with a narrow host range show great differences in abundance when their hosts are distributed unequally.

There are also some differences in the occurrence and distribution of particular fungal species according to the size of a populated area. The greatest species number was recorded in the largest cities. Some wood-decaying fungi such as Ganoderma australe (Fr.) Pat. occur almost exclusively in areas of the human habitation or areas influenced by the human activity (known as synantropic species) (TELLO et al., 2005).

The goal of this work is to find out polypore diversity and their binding to host trees in selected type of the urban vegetation areas in observed towns.

Materials and methods

The field research was realised in 8 towns of northern, central and southern Slovakia: Dolný Kubín, Tvrdošín, Námestovo, Ružomberok, Zvolen, Detva, Lučenec, and Fiľakovo. In-field research ran for two years. The findings are recorded in 3 categories of urban vegetation: town parks, street lines (alleys), and streamside stands. Findings were repeatedly taken place in all three sampling sites. The harmonogram of sampling was as follows:

1st collection: October–November 2010
2nd collection: May–June 2011
3rd collection: November 2011.

The polypores were collected according to the harmonogram of their fructification growing period. There were the fruting bodies of the expected higher incidence and greater diversity of occurring polypores in spring and autumn. Abstraction activities were performed repeatedly in the same localities. Occurrence of new findings was recorded on host trees. We recorded essential characteristics of occurring polypores, host trees, and habitat in which host occurred during abstraction in the field.

The patterns of the field record were as follows: sequential sample number, type of fungus, town, street, who collected, who determined, collection date, GPS coordinates of finding, altitude, type of host tree species, type of fructification bodies, the number of fructification bodies, place of fructification bodies on tree species, description of tree damage (presence of cavities, rots, crown-dying and other visible damage; in case of cavity – height, depth and width of the cavity), diameter of the trunk and description of habitat conditions. The sample material obtained in the field research was therefore determined in the laboratory. Individual wood-decaying polypores were determined by using of the designation keys (HAGARA et al., 2005; HANSEN and KNUDSEN, 1992; BREITENBACH and KRÄNZLIN, 1986; JÜLICH, 1984). The evaluation of the results was necessary for creating the comprehensive database containing all collected data during the field research.

Results

During the field research in the years 2010 and 2011 we recorded 102 findings, 20 taxa and 13 genera of polypores in the selected towns of northern, central and southern Slovakia (Fig. 1.). As it is obvious from the chart, most commonly occurring taxon was Phellinus igniarius s. l., which accounted for 13.73% of all the findings. As relatively frequent taxa, Fomes fomentarius (L.) J. J. Kickx (10.78%), Bjerkandera adusta (Willd.) P. Karst. (8.82%), and Trametes versicolor (L.) Pilát (8.82%) were recorded. Rare taxa were Ganoderma resinaceum Boud., Inonotus hispidus (Bull.) P. Karst., Inonotus rhedae (Pers.) Bondartsev & Singer, Phellinus alni (Bond.) Parmasto, and Spongipellis spumeus (Sowerby) Pat. (Fig. 2).

The individual samples were collected in three selected kinds of the urban vegetation – town parks, street lines (alleys) and streamside stands. The town parks and street lines were the most frequent habitat of polypores. A great number of findings was recorded in the towns of Zvolen and Lučenec. For the town of Zvolen, there were recorded 30.69% of all findings and 20.79% in the town of Lučenec. The fewest findings were recorded in the towns of Fiľakovo and Námestovo, there was approximately equal number of the polypores – 2.97% of all recorded findings (Fig. 3).

The most frequently occurring polypores were in the town parks of Zvolen and Lučenec, no incidence was recorded in this category in Námestovo. The most frequently occurring polypores were recorded in the street lines of Zvolen, Dolný Kubín, and Detva and no occurrence was recorded in Námestovo. For streamside stands, the most frequently occurring polypores were in Zvolen and Ružomberok and no occurrence was in Fiľakovo, Dolný Kubín and Detva (Fig. 4).

The polypores colonized 14 genera of the host trees. The most often were Acer platanoides L., Aesculus hippocastanum L., Cerasus serrulata (Lindl.) Loudon and Salix × sepulcralis ‘Tristis’. The highest number of taxa of the host plants was recorded in Zvolen and Detva. For Zvolen it was 10 taxa and 8 taxa in Lučenec. 5 taxa of polypores were recorded in Detva and Tvrdošín. The least spectrum of the host plants was in Dolný Kubín (2 taxa).
Mentioned taxa were associated with different parts of host plant and they were as it follows: *Bjerkandera adusta* (Willd.) P. Karst., *Cerrena unicolor* (Bull.) Murrill, *Daedaleopsis confragosa* (Bolton) J. Schröc., *Phellinus pomaceus* (Pers.) Maire, *P. igniarius* s. l., *Trametes gibossa* (Pers.) Fr., *T. hirsuta* (Wulfen) Lloyd, and *T. versicolor* (L.) Lloyd. *Bjerkandera fumosa* (Pers.: Fr.) P. Karst. was observed on stem and stump, and *F. fomentarius* (L.) J. J. Kickx on stem and branches. Other taxa were bound to a specific part of host plant:

Fig. 1. The map of field research of distribution of polypores in the towns of Námestovo, Tvrdošín, Dolný Kubín, Ružomberok, Zvolen, Detva, Lučenec, and Fiľakovo.

Fig. 2. The number of all polypore species collected from all selected towns (%).
Ganoderma applanatum (Pers.) Pat., G. resinaceum Boud., and Inonotus rheades (Pers.) Bondartsev & Singer on the base of stem; Chondrostereum purpureum (Pers.) Pouzar, Laetiporus sp., Oxyporus populinus (Schumach.) Donk and Phellinus alni (Bondartsev) Parmasto on stem; Inonotus hispidus (Bull.) P. Karst. and Phellinus pomaceus (Pers.) Maire on branches and Spongipellis spumeus (Sowerby) Pat. in cavity (Fig. 5). The greatest number of polypores was observed on the stem. These findings accounted for 53% of the
comprehensive spectrum. On the stumps, we recorded 21% of all polypore findings. In the cavities, there were 10% of all polypores, on the branches 9%, and on the base of stem, only 7% of all findings were recorded (Fig. 6).

Discussion

The occurrence and the species diversity of the polypores are affected by environmental pollution and nature habitats. HAGARA et al. (2005) report that *Fomes fomentarius* (L.) J. J. Kickx is found very abundantly on living and dead wood of different species of the hardwoods. In our case it is occurred more widely and represented until 10.78% of all collected species. Polypores were bound to 20 taxa of woody host plants. SCHWARZE et al. (2004) indicate that great number of wood-destroying fungi which cause white rot occur on the hardwoods, what we can confirm. TOMALAK et al. (2011) point out the fact that caring of trees should already be started by selecting of the type in urban vegetation. It is appropriate to plant trees originating from the northern coastal areas, exposed to strong winds and salt spray in our conditions. We found that the most invading tree plant species are *Acer pseudoplatanus* L., *Acer platanoides* L., *Aesculus hippocastanum* L., *Salix × scepulcralis* ‘Tristis’. The vitality of these plants is reduced mainly by frosts in our northern towns observed and by products of human activity. HUDEKOVÁ (2002) concludes that in spite of attempt to apply domestic plants their utilization is difficult in urban polluted en-
The polypores colonized 14 genera of host trees. The most often were *Acer platanoides* L., *Aesculus hippocastanum* L., *Cerasus serrulata* (Lindl.) Loudon, and *Salix × sepulcralis* ‘Tristis’. The polypore taxa colonized different parts of host plant. The greatest number of polypores was observed on the stem (53%) and on the stumps (21%).

**Acknowledgements**

The study was supported by Slovak Grant Agency KEGA 022UMB-4/2013.

**References**


Conclusions

During 2010–2011 we recorded 102 findings of polypores (20 taxa, 13 genera) in categories town parks, street lines (alleys), and streamside stands in the towns of Námestovo, Tvrdošín, Dolný Kubín, Ružomberok, Zvolen, Detva, Fiľakovo, and Lučenec. The most often taxa were *Phellinus igniarius* s. 1. (13.73%) and *Fomes fomentarius* (L.) J. J. Kickx (10.78%). The town parks and street lines were the most frequent habitats of polypores. A great number of findings was recorded in the towns of Zvolen (30.69%) and Lučenec (20.79%). The polypores colonized 14 genera of host trees.


Received May 26, 2013
Accepted July 10, 2013