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## OCCURRENCE OF ENTOMOPATHOGENIC FUNGI IN SELECTED PARKS AND URBAN FORESTS OF THE WARSAW DISTRICT URSYNÓW

### WYSTĘPOWANIE GRZYBÓW ENTOMOPATOGENNYCH W WYBRANYCH PARKACH I LASACH MIEJSKICH WARSZAWSKIEJ GMINY URSYNÓW

**Abstract:** The present study concerns choice composition, as well as intensification of occurrence entomopathogenic fungi on chosen terrains of the park and municipal forests of the Ursynow district in Warsaw. The following entomopathogenic fungi were isolated: *Peecilomyces fumosoroseus*, *Bauveria bassiana* and *Metharidium anisopliae*. Position did not influence the occurrence of entomopathogenic fungi. However, different seasons of the year had an influence on the occurrence of the fungi. *P. fumosoroseus* turned out to be predominant in spring, summer, while *B. bassiana* in autumn.

**Keywords:** entomopathogenic fungi, soil, season of year

There are c. 200 species of entomopathogenic fungi in Poland. Most of them infect insects rarely or occasionally [1]. Their presence and activity in the environment depend on abiotic and biotic conditions. Under favourable conditions such as appropriate temperature, moisture and host availability, these fungi may largely reduce the number of insects at various stages of their growth. Apart from typical environmental factors, the number of fungi is controlled by human activity – plant protection chemicals and heavy metals introduced to soils [2, 3].

Warsaw – a modern city – is a complex socio-economic, technical and also biological system. Natural greenery and artificial green complexes play an important role in the functioning of this urban agglomeration. There are many insect species, which are the food base for entomopathogenic fungi in urban green areas. These fungi most often attack soil-dwelling insects. Individuals dead due to mycosis are a source of

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spreading the disease and often become hotbeds of epizootic diseases [4, 5]. Now entomopathogenic fungi are used in plant protection in greenhouses and field crops. Their increasing importance for pest control, particularly in monocultures, raised the interest in domestic species and their occurrence in various ecosystems [6–8].

The aim of this study was to estimate species composition of entomopathogenic fungi in urban greens of the Ursynow district in Warsaw during various seasons.

## Material and methods

Soil samples collected in 2007 from five selected sites in the Ursynow district were used in the experiment. Soil was collected from: the park of the Warsaw University of Life Sciences – Ursynow Escarp (soil pH 4.7–6.8), Park of Culture in Powsin (pH 4.7–6.6), Roman Kozłowski's Park (pH 4.7–6.8) and from two city forests – Kabaty (soil pH 3.2–4.9) and Natolin (pH 3.2–4.9). Mixed samples were taken in triplicate during various phenologic seasons with the soil cane to the depth of 20 cm.

Fungi were isolated from soil samples with the method of Zimmermann (1986) [9] using trap insects. Caterpillars of *G. mellonella* from the own culture of the Department of Zoology WULS were the trap animals. Experiments were carried out at 25 °C for 25 days for each soil sample. First control was performed 5 days after set up of the experiment and then the samples were controlled every 2–3 days. Dead insects were removed from samples and replaced by live ones. Dead insects were transferred to Petri dishes to estimate the cause of their death and to complete the growth of mycelium on the skin surface. The obtained results were statistically processed with the Statgraphics Plus 4.1 programme.

## Results and discussion

Three species of entomopathogenic fungi (*Peecilomyces fumosoroseus*, *Bauveria bassiana*, *Metharizium anisopliae*) were isolated from soils of the greens in the Ursynow district of Warsaw. The studied sites did not differ significantly in species composition of entomopathogenic fungi. *P. fumosoroseus* was the dominating species in analysed soil samples. Depending on site it infected from 45 % to 73 % of insects. The second frequent species was *B. bassiana* which infected 25 % to 39 % of insects. *M. anisopliae* was isolated sporadically and only in spring (Table 1).

Apart from typical infections caused by entomopathogenic fungi the trap insects were also infected by saprophages and by entomopathogenic nematodes (Table 1). In samples collected in spring the trap insects were infected by nematodes more than by fungi in other seasons.

Changes in the density of particular species of isolated fungi were related to a phenologic season (Table 2). Season exerted a significant effect on *M. anisopliae*. This fungus was most numerous in early spring; only few mycelia were noted in summer. The species was not found in soils from forest areas.

Table 1

The occurrence of entomopathogenic fungi in the greens of the Ursynow district of Warsaw

		SGGW – Ursynow Escarp	Park of Culture in Powsin	Roman Kozłowski's Park	Forest Natolin	Forest Kabaty
Entomopathogenic fungi	<i>B. bassiana</i>	5.3*	6	7.7	8.3	6.7
	<i>P. fumosoroseus</i>	15.3	8.7	11	13	16.3
	<i>M. anisopliae</i>	0.3	4.7*	2.7*	0	0
Saprophytic fungi		0.7	0.7	2	0	0.3
Entomopathogenic Nematode		4.7	7	5	7.3	5
Other biotic factor		3.7	3	1.7	1.3	1.7

\*  $p > 0.05$  denotes a statistically significant difference.

Table 2

The effect of season on isolated species of entomopathogenic fungi

Season	<i>B. bassiana</i>	<i>P. fumosoroseus</i>	<i>M. anisopliae</i>	Saprophytic fungi
Spring	4.7	21.7*	4.3	0.7
Summer	4.0	25.3*	3.3	1.7
Autumn	25.3*	17.3	0	1.3

\*  $p < 0.001$  denotes a statistically significant difference.

*P. fumosoroseus* dominated in studied ecosystems in spring and summer. In spring it was found in 71 % of trap insects. In summer it infected 78 % of insects. In autumn the dominant species was *B. bassiana* which infected 59 % of isolated trap insects.

The obtained results confirm observations made by other authors on the common occurrence of the three species of fungi in various ecosystems [4, 9, 10]. They found another species – *P. farinosus* – which was not present in the soils analysed within this study. Studies carried out by other authors [11, 12] in Poland indicate that entomopathogenic fungi are most frequent in forest ecosystems which have naturally richer flora and fauna. This finding was confirmed in this study since most entomopathogenic fungi were isolated from soils collected in Kabaty Forest.

Common occurrence of the three species of entomopathogenic fungi was confirmed by other authors [4]. They demonstrated that *P. fumosoroseus* was the dominating species in contrast to other European countries where it occurs less frequently [13].

The Ursynow district, despite strong human impact, is very attractive to insects because of the presence of green areas in its territory. That is why insects as potential hosts of entomopathogenic fungi are affected by mycoses there contributing thus to species diversity of pathogens [14].

## Conclusions

1. Three most frequent species of entomopathogenic fungi: *P. fumosoroseus*, *B. bassiana* and *M. anisopliae* were isolated from soils in the city greens and forests of the Ursynow district.

2. *P. fumosoroseus* was the dominating species in studied soils and *M. anisopliae* was found rarely.
3. Season affected the occurrence of particular species of entomopathogenic fungi.

## References

- [1] Bałazy S.: *Biotechnologia* 2000, **3**(50), 11–32.
- [2] Bajan C.: *Biotechnologia* 2000, **3**(50), 58–64.
- [3] Jaworska M., Jasiewicz C. and Gorczyca A.: *Post. Ochr. Rośl.* 1997, **37**, 276–278.
- [4] Miętkiewski R., Żurek M., Tkaczuk C. and Bałazy S.: *Rocz. Nauk Roln. Seria E* 1991, **21**(1/2), 61–68.
- [5] Miętkiewski R. and Górski R.: *Zesz. Nauk. Akad. Podlaskiej, ser. Roln.* 2000, **57**, 13–19.
- [6] Ignatowicz S.: *Nowoczesne Roln.* 1998, **4**, 44–45.
- [7] Miętkiewski R. and Miętkiewska Z.: *A. Mycology* 1993, **28**(1), 77–82.
- [8] Miętkiewski R., Miętkiewska Z. and Jankowski K.: *Mycology* 1993, **28**(2), 161–169.
- [9] Zimmermann G.: *J. Appl. Entmol.* 1986, **102**, 213–215.
- [10] Leger R.J., Goettel M., Roberts D.W. and Staples R.C.: *Invertebr. Pathol.* 1991, **58**, 168–179.
- [11] Bałazy S.: *Las Polski* 1981, **3**, 14–15.
- [12] Głowacka B. and Świeżyńska H.: *Pr. Inst. Badaw. Leśnict.* 1993, **767**, 117–136.
- [13] Miętkiewski R. and Kolczarek R.: *Zesz. Nauk. Wyższej Szkoły Roln.-Pedag. w Siedlcach, ser. Roln.* 1995 **39**, 91–95.
- [14] Miętkiewski R.: *Ochr. Rośl.* 1994, **38**(11), 13–14.

## WYSTĘPOWANIE GRZYBÓW ENTOMOPATOGENNYCH W WYBRANYCH PARKACH I LASACH MIEJSKICH WARSZAWSKIEJ GMINY URSYNÓW

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**Abstrakt:** W pracy przedstawiono skład oraz nasilenie występowania grzybów entomopatogennych w wybranych parkach i lasach miejskich gminy Ursynów w Warszawie. W pracy zwrócono uwagę także na różnicę w występowaniu w zależności od miejsca bytowania i okresu fenologicznego. Na badanych terenach wyizolowano następujące gatunki grzybów: *P. fumosoroseus*, *B. bassiana* oraz *M. anisopliae*. Stwierdzono, że siedlisko nie miało wpływu na występowanie grzybów entomopatogennych, natomiast wpływ miał okres fenologiczny. Dominującym gatunkiem okazał się *P. fumosoroseus* (wiosna, lato), a na jesieni dominowała *B. bassiana*.

**Słowa kluczowe:** grzyby entomopatogenne, gleba, sezon fenologiczny