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NATURAL OUTBREAK OF AN ENTOMOPHTHORALEAN FUNGUS, *PANDORA NEOAPHIDIS* ON *MACROSIPHUM* SP. (SCIENTIFIC NOTE)

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Abstract: Fungi belonging to order Entomophthorales (Zygomycota, Zygomycetes) form a group in which most of the species are entomopathogenic. Up to now it was found that 33 species grouped in three families and nine genera may limit aphid populations. Entomophthoralean fungi are considered important pathogens to aphids in nature. During 2014 summer, a natural outbreak caused by *Pandora neoaphidis* (Remaudiere et Hennebert) Humber in a population of *Macrosiphum* sp. (Aphididae) has been identified in a culture of roses in Northern Bucharest. Although it is cosmopolitan, the authors haven't found scientific reports with reference to this species in Romania.

Key words: *Pandora neoaphidis, Macrosiphum sp., Entomophthorales*

Fungi of order Entomophthorales are distributed worldwide and prefer the terrestrial habitats, except the genus of *Ancylistes* (Balazy, 1993). This capability of entomophthoralean fungi to attack insects drew the attention to the possibility of using them in biological control of pest. Although Entomophthorales, which includes 33 species pathogenic to aphids (table 1), represents a potential biological control agent (Barta & Cagáň, 2006), there are no bioinsecticides related to this order.

In Romania, the entomopathogenic fungi of order Entomophthorales were first described by Bontea (1953, 1985): *Entomophthora sphaerosperma* Fres. on *Zabrus tenebrioides* Goeze (*E. sphaerosperma = Empusa* or *E. radicans*), *Empusa muscae* Kolm. on *Musca domestica* L. and *E. aphidis* Hoffm. on *Anoecia corni* Fab. Stana (1993) described some biological and ecological characters of entomophthoralean fungi and nominalized *E. sphaerosperma* on *Pieris brassicae*, *E. aphidis* as parasite of aphids, *Zoophthora radicans* Bref. on *Z. tenebrioides*, *E. rhizospora* Thaxter and *E. apiculata* Thaxter on different larvae and pupae and *E. nebriae* Raukiaer on an unidentified insect.

Several names have been used as synonyms for *Pandora neoaphidis*: *Erynia neoaphidis* Remaud & Hennebert, *Zoophthora neoaphidis* (Remaud & Hennebert) Ben Ze'ev & R.G. Kenneth and *Z. neoaphidis* (Remaud & Hennebert) Balazy.

METHODS

Adults and nymphs of *Macrosiphum* sp. with sign of fungal infections (figure 1) were collected during 2014 summer in the Research-Development Institute for Plant Protection Bucharest rosarium (44°30'15.1"N 26°04'27.7"E).

The methods used for collecting spores of *P. neoaphidis* were based on the "shower conidia" technique as described by Keller (2007). Briefly, the dead insects were placed on a moistened piece of filter paper on the inner side of a Petri dish lid and a slide was placed at

the bottom of Petri dish for collecting primary conidia. Primary conidia and hyphal bodies, stained with lactophenol, were analysed using a microscope under 400x magnifications and the measurements confirmed *P. neoaphidis* as it has been described by Remaudiere and Hennebert (1980). No resting spores were found inside insects cadavers.

Predatory coccinellids have been also observed in the same location (figure 2). All rose plants were infested with aphids and fungal infection was also present in all spots. Predatory coccinellids were present on 80% of plants. Roy (2001) and Wells (2011) found that transmission of *P. neoaphidis* in a population of aphids is greater when the predatory coccinellids are present.

The rosarium was also monitored during 2015 summer, aphids and predatory coccinellids were present but no signs of entomophthorales infection on aphids were identified. Also, an experiment aimed to recover the fungi from soil using bait insects (*Galleria mellonella* L.*)* was unsuccessful. The Research-Development Institute for Plant Protection Bucharest rosarium is continuously monitored for occurrence of entomopathogenic fungi.

Figure 1. *Macrosiphum sp*. with sign of fungal infections (Bucharest, 2014)

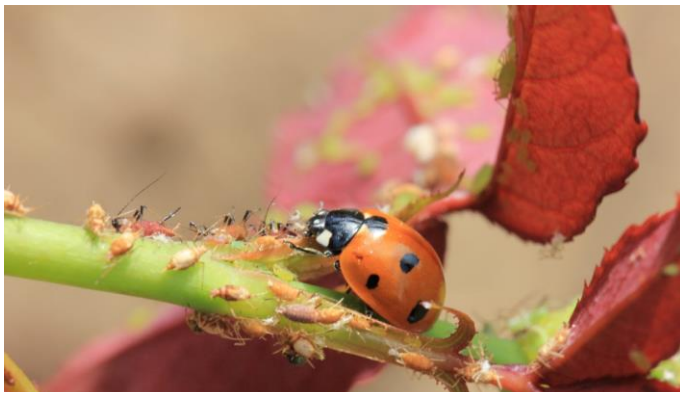

Figure 2. Predatory coccinellid feeding on aphids (Bucharest, 2014)

Table 1. Aphid's pathogens belonging to the order of Entomophthorales

Family	Genus	Species
Entomophthoraceae Nowakowski Bot. Ztg. 34: 216–222 (1877)	***Pandora*** Humber Mycotaxon 34: 451–453 (1989)	***Pandora neoaphidis*** (Remaudiere et Hennebert) Humber
		Pandora nouryi (Remaudiere et Hennebert) Humber
		Pandora kondoiensis (Milner) Humber
		Pandora uroleuconii Barta et Cagáň
		Pandora delphacis (Hori) Humber
	Erynia (Nowakowski ex Batko) Remaudiere et Hennebert Emend. Humber Mycotaxon 34: 448–449 (1989)	***Erynia erinacea*** (Ben-Ze'ev et Kenneth) Remaudiere et Hennebert
		Erynia conica (Nowakowski) Remaudiere et Hennebert
	Zoophthora (Batko) Remaudiere et Hennebert Mycotaxon 11: 301 (1980) ere et Hen-	***Zoophthora aphidis*** (HoffmaninFresenius) Remaudiere et Hennebert
		Zoophthora phalloides Batko
		Zoophthora radicans (Brefeld) Batko
		Zoophthora canadensis (MacLeod, Tyrrell et Soper) Remaudiere et Hennebert
		Zoophthora occidentalis (Thaxter) Batko
		Zoophthora orientalis Ben-Ze'ev et Kenneth
		Zoophthora anhuiensis (Li) Humber
	Entomophthora Fresenius *sensu* Remaudiere et Keller	***Entomophthora planchoniana*** Cornu
		Entomophthora chromaphidis Burger et Swain
	Entomophaga Batko emend. HumberMycotaxon 34: 447–448 (1989)	***Entomophaga pyriformis*** (Thoizon) Balazy
	Batkoa Humber Mycotaxon 34: 446–447 (1989)	***Batkoa apiculata*** (Thaxter) Humber
		***Batkoa major* (Thaxter) Humber**
Neozygitaceae Ben-Ze'ev et Kenneth in Ben-Ze'ev et al. Mycotaxon 28: 313–326 (1987)	***Neozygites*** Witlaczil Arch. Mikrosk. Anat. 24: 599–603 (1885)	***Neozygites fresenii*** (Nowakowski) Remaudiere et Keller
		Neozygites microlophii Keller
		Neozygites turbinata (Kenneth) Remaudiere et Keller
		Neozygites lageniformis (Thaxter) Remaudiere et Keller
		Neozygites lecanii (Zimmermann) Balazy
		Neozygites cinarae Keller
		Neozygites remaudierei S. Keller
		Neozygites slavi S. Keller
Ancylistaceae J. Schröt. Die Natürlichen Pflanzenfamilien 1: 92 (1893)	***Conidiobolus*** Brefeld emended Humber Mycotaxon 34: 455–456 (1989)	***Conidiobolus coronatus*** (Costantin) Batko
		Conidiobolus obscurus (Hall et Dunn) Remaudiere et Keller
		Conidiobolus thromboides Drechsler
		Conidiobolus osmodes Drechsler
		Conidiobolus destruens (Weiser et Batko) Ben-Ze'ev
	Tarichium Cohn	***Tarichium atrospermum*** (Petch) Balazy

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