First Hungarian record of the fungus *Hesperomyces virescens* (Ascomycota: Laboulbeniales), parasitic on the harlequin ladybird (Coccinellidae: *Harmonia axyridis*)

A *Hesperomyces virescens* (Ascomycota: Laboulbeniales) gombafaj első magyarországi előfordulása, a harlekinkatica parazitájaként (Coccinellidae: *Harmonia axyridis*)

Walter P. Pfliegler

Abstract: The fungus *Hesperomyces virescens* Thaxter. (1891) is reported from the first time from Hungary. A few specimens of this parasite belonging to the enigmatic Laboulbeniales were found on the invasive harlequin ladybird [*Harmonia axyridis* (Pallas, 1773)] in the city of Debrecen.

Key words: Laboulbeniales, *Harmonia axyridis*, new record, insect pathogen, Hungary.

Author's address: Walter P. Pfliegler, Department of Genetics and Applied Microbiology, University of Debrecen, Egyetem tér 1., H-4032 Debrecen, Hungary.
E-mail: walterpfliegler@gmail.com

Összefoglalás: A *Hesperomyces virescens* Thaxter (1891) nevű gombafaj először kerül kimutatásra Magyarország területéről. A hiányosan ismert Laboulbeniales rendbe tartozó parazita néhány példánya az invazív harlekinkaticáról [*Harmonia axyridis* (Pallas, 1773)] került elő Debrecen városából.

Introduction

Laboulbeniales are specialized fungi with an ectoparasitic lifestyle on arthropods. They are unique for their unusual morphology (e.g. strongly reduced formation of hyphae and determinate cell division) that even led some 19th century taxonomists to consider them as worms instead of fungi (Weir & Blackwell, 2001). Laboulbeniales were initially placed among basidiomycetous or zygomycetous fungi, but later, based on their spore formation, they were recognized as members of the Ascomycota (Thaxter 1891). Only recently has the taxonomic position of the order been settled: they were transferred to their own class based on molecular studies (Weir & Blackwell, 2001). Several Laboulbeniales have been reported or even described from Hungary by József Bánhegyi (summarized in Bánhegyi et

al. 1985) but since than only data on the ant-parasitic species *Rickia wassmannii* has been published from the country (Tartally et al. 2007). Although Bánhegyi studied many families of Coleoptera for their parasites, no Laboulbeniales from ladybirds (Coccinellidae) were reported from Hungary so far. Members of the genus *Hesperomyces* have also not been reported.

Several aspects of *Hesperomyces virescens* make this species particularly interesting. Its developmental biology (Weir & Blackwell 1996), infection mechanism (Riddick 2006; Nalepa & Weir 2007) and distribution are well known, making it probably the best-studied species of its class. Also, although *H. virescens* infects several species of Coccinellidae, its most famous host is the harlequin ladybird that is alarmingly invading Europe and North-America and has received a great deal of attention in Hungary also (e.g. Merkl 2008). In Europe, *H. virescens* has so far been found on this invasive beetle in the Netherlands, in Germany, Belgium and in the Czech Republic, while on native ladybirds, it has been published from some other countries as well (Ceryngier & Twardowska 2013 and references therein). The closest known record of *H. virescens* to Hungary is that from Vienna (Christian 2001).

Materials and Methods: Specimens of the harlequin ladybug were hand collected on windows (altogether 40 specimens) and examined under a binocular microscope. Infected beetles were photographed with a DSLR camera with macro set. One thallus was preparated into Heinz PVA for microscope studies (slide deposited in the collection of the Department of Genetics and Applied Microbioogy, University of Debrecen). Other specimens are stored in 85% ethanol in the author's collection. Light microscopy images were taken with an Olympus BD40 microscope equipped with an Olympus 40x lens and with a digital microscope camera. Images were stacked using ZereneStacker software and enhanced in Photoshop (Adobe).

Results and Discussion

Hesperomyces virescens Thaxter (1891) (Figure 1a-c.)

Material: Debrecen, main campus of the University of Debrecen (N47° 33'17" E21°37'12"), on *Harmonia axyridis* ladybird (on the elytra) inside a building, 11.03.2014. - 5 thalli in a cluster + 4 thalli in a cluster on two beetle specimens.

Of the 40 harlequin ladybird specimens studied, only two were infected with *H. virescens*, suggesting that the incidence of this parasite is not high in the overwintering population studied. Only a single cluster of 4-5 thalli were found on each infected beetle. The thalli were in a near-mature state, with almost completely differentiated apical cells, enlarged perithecium

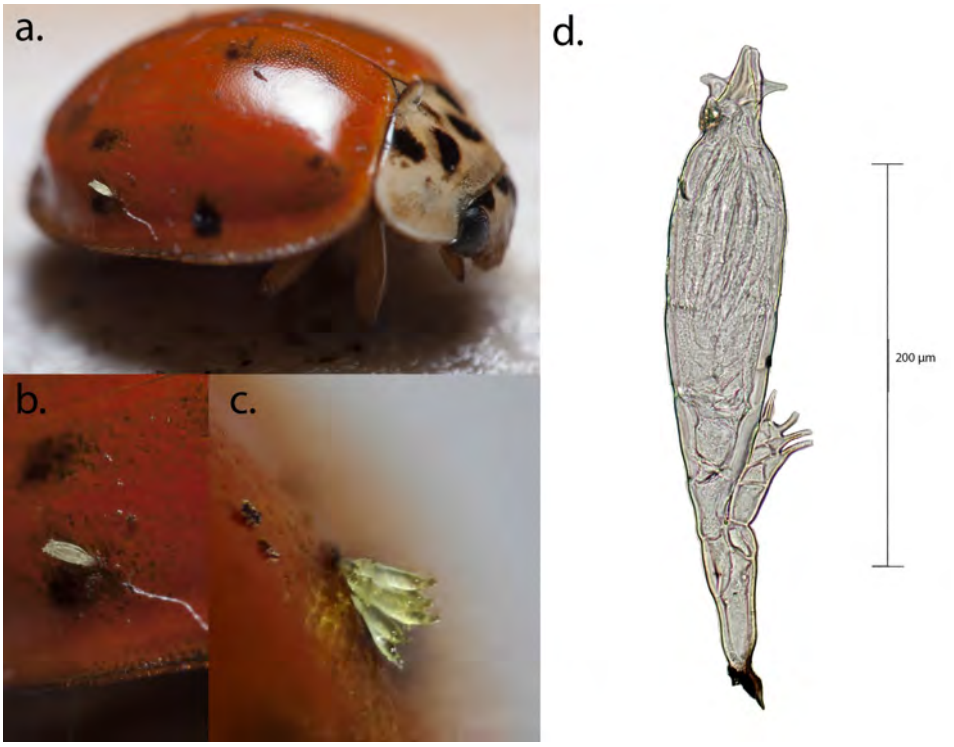

Figure 1. Thalli of *Hesperomyces virescens*. a. host (*Harmonia axyidis*). b-c. clusters of thalli on the elytron. d. Single thallus with transmitted light microscopy.

with visible spores, and a palmate antheridium (compare to Weir and Bakes 1996).

The observation of *Hesperomyces virescens* thalli parasitic on the invasive harlequin ladybird in Debrecen provide the first records of the species and the genus *Hesperomyces* Thaxter 1891 in Hungary. The presence of this parasitic fungus in Hungary may be interesting in regard of its notorious invasive host species and also highlight that even the relatively well-known insects species may have interesting but so far neglected parasites.

Acknowledgements: The author thanks Dr. Matthias Sipiczki for his continuous support in the study of microfungi isolated from various substrates, even insects. This research was supported by the European Union and the State of Hungary, co-financed by the European Social Fund in the framework of TÁMOP-4.2.4.A/ 2-11/1-2012-0001 'National Excellence Program'.

References

Bánhegyi J., Tóth S., Ubrizsy, G. & Vörös J. 1985: Magyarország mikroszkopikus gombáinak határozókönyve 1–3. – Akadémiai Kiadó, Budapest, 1316 p.

Ceryngier P., Twardowska K. 2013: *Harmonia axyridis* (Coleoptera: Coccinellidae) as a host of the parasitic fungus *Hesperomyces virescens* (Ascomycota: Laboulbeniales, Laboulbeniaceae): A case report and short review. – European Journal of Entomology 110(4): 549–557.

Christian E. 2001: The coccinellid parasite *Hesperomyces virescens* and further species of the order Laboulbeniales (Ascomycotina) new to Austria. – Annalen des Naturhistorischen Museums in Wien 103: 599–603.

De Kesel A. 2011: *Hesperomyces* (Laboulbeniales) and coccinellid hosts. – Sterbeeckia 30: 32–37.

Merkl O. 2008: A harlekinkatica (*Harmonia axyridis* Pallas) Magyarországon (Coleoptera: Coccinellidae) [First record of the harlequin ladybird (*Harmonia axyridis* Pallas) in Hungary]. – Növényvédelem 44: 239–242.

Nalepa C. A., Weir A. 2007: Infection of *Harmonia axyridis* (Coleoptera: Coccinellidae) by *Hesperomyces virescens* (Ascomycetes: Laboulbeniales): role of mating status and aggregation behavior. – Journal of Invertebrate Pathology 94(3): 196–203.

Riddick E. W. 2006: Influence of host gender on infection rate, density and distribution of the parasitic fungus, *Hesperomyces virescens*, on the multicolored Asian lady beetle, *Harmonia axyridis*. Journal of Insect Science 6: 1–15.

Tartally A., Szűcs B. & Ebsen J. R. 2007: The first records of *Rickia wasmannii* Cavara, 1899, a myrmecophilous fungus, and its *Myrmica* Latreille, 1804 host ants in Hungary and Romania (Ascomycetes: Laboulbeniales; Hymenoptera: Formicidae). – Myrmecological News 10: 123.

Thaxter R. 1891: Supplementary note on North American Laboulbeniaceae. – Proceedings of the American Academy of Arts and Science 25: 261–270.

Weir A. & Beakes G. W. 1996: Correlative light and scanning electron microscope studies on the developmental morphology of *Hesperomyces virescens*. – Mycologia 88: 677–693.

Weir A. & Blackwell M. 2001: Molecular data support the Laboulbeniales as a separate class of Ascomycota, Laboulbeniomycetes. – Mycological Research 105: 1182–1190.