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A new host plant for *Monochaetia monochaeta* from Southern Anatolia

Fatma Akdeniz[1], Hacer Sert[2]

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English oak,
Türkiye

Abstract — This study aims to report the endophytic fungal pathogen *Monochaetia monochaeta* (Desmazières) Allesch on *Quercus robur* Linnaeus (English oak) for the first time from Anatolia (Türkiye). The microscopic and macroscopic properties of the fungus, the symptoms it creates in the host plant, and the distribution of the disease in the world are explained. With the new host record revealed by this research, a contribution was made to the Turkish Mycoflora and the scientific world. Additionally, it has been emphasized that fungal diseases can cause serious yield loss and, therefore, significant economic losses in plants worldwide and that much more research should be done on these disease agents and host plants based on systematic and biological control studies.

Subject Classification (2020):

1. Introduction

Endophytic fungi are commonly known as mycoparasitic fungi and occur in different parts of the world. They live in regions such as the Arctic and Antarctica and natural habitats in the oceans, rainforests, deserts, ferns, gymnosperms, and angiosperms [1]. Endophytic fungi live in the inner tissues of living plants, such as in leaves and root tissues, stems, flowers, fruits, and seeds [2]. These fungi cause severe damage to many plants living in their natural ecosystems. They can cause crop losses in wild fruit trees and shrubs [3]. The genus *Monochaetia* (Sacc.) Allesch. is characterized by brown median cells, a single cellular apical appendage, a single centric basal appendage (if present), and basal extension, morphologically acervular conidiomata, fusoid, and transverse septate conidia morphologically. *Monochaetia monochaeta* is reported to be common in host families such as *Fagaceae*, *Ericaceae*, *Aceraceae,* and *Myrtaceae. M. monochaeta* is a fungus that harms deciduous trees, especially *Quercus, Castanea, and Rhododendron* species, in their natural environment [1,4,5]. It is a pathogenic species that cause severe economic damage to *Castanea sativa* Mill. (Anatolian chestnut) [6]. In the long cultivation history of Quercus trees, fungal diseases have caused severe economic and ecological problems [7]. In this study, *Quercus robur,* infected by *Monochaetia monochaeta,* has been recorded as a new host plant in Türkiye.

[1]fakdeniz@akdeniz.edu.tr (Corresponding Author); [2]hacersert@akdeniz.edu.tr
[1]Department of Plant and Animal Production, Manavgat Vocational School, Akdeniz University, Antalya, Türkiye
[2]Department of Recreation Management, Manavgat Faculty of Tourism, Akdeniz University, Antalya, Türkiye
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2. Materials and Methods

The material of this study consists of plant specimens infected by parasitic fungi collected in Manavgat (Antalya, Türkiye) between 2015–2017, especially in spring and autumn. During field studies, the sample species' necessary morphological and ecological properties were noted and photographed. The host samples were prepared according to established herbarium techniques. For the morphological examination of hosts and microfungi, a stereo microscope (SM) (Nikon C-Leds) and a light microscope (LM) (Nikon Eclipse E100) were used. Colonies and spores from the specimens were examined with a light microscope (Nikon Eclipse E100) and measured at least 15 times for each specimen (Figure 2). The host samples were identified using relevant literature [8,9]. In the identification of parasitic fungus, Dematiaceous Hyphomycetes [10], More Dematiaceous Hyphomycetes [11], Parasitische Pilze a Gefaesspflanzen in Europa [12], index fungorum website [13] and The Global Biodiversity Information Facility [14] have been used. The samples are preserved at the Laboratory of Manavgat Tourism Faculty, Akdeniz University (Türkiye). Figure 1 shows the *Q. robur* (English Oak) and *Fagaceae* localizations: Antalya, Manavgat, and Sorgun pine forests.

Figure 1. Satellite view of Manavgat city

3. Results and Discussion

Macro and microscopic features and the taxonomy of the fungus species are given below:

Taxonomy

Ascomycota

Sordariomycetes

Amphisphaeriales

Amphisphaeriaceae

Monochaetia (Sacc.) Allesch

Monochaetia monochaeta (Desm.) Allesch., Rabenh. Krypt.-Fl., Edn 2(Leipzig) 1(7): 667(1902)[1903]

Synonyms:

Hyaloceras monochaetum (Desm.) Died.

Hyaloceras monochaetum var. *gallicola* (Trotter) Died.

Monochaetia desmazieri Sacc. & D. Sacc.

Monochaetia desmazieri var. *gallicola* (Trotter) Sacc. & Traverso

Monochaetia monochaeta var. *gallicola* (Trotter) Allesch., Rabenh.

Pestalotia monochaeta Desm.

*Pestalotia monochae*ta var. *gallicola* Trotter

M. monochaeta forms black-bordered dark brown spots on both sides of the host leaf, 90-140µ in size. Conidia, elliptical or narrow fusiform, broad spindle-shaped, light olive-colored, 13-21 × 3-5µ*m* in size, usually four cells, sometimes 5 or 3 apical cells thin-walled, naked, 3-12µ*m* long simple appendage, middle cell barrel-shaped, basal cell truncated funnel-shaped simple appendage (Figure 2 a-d).

Specimen Examined – On *Q. robur* (English Oak) Fagaceae Türkiye: Antalya, Manavgat, Sorgun pine forest, at sea level, 12.10.2015, FA 3061 (Figure 1).

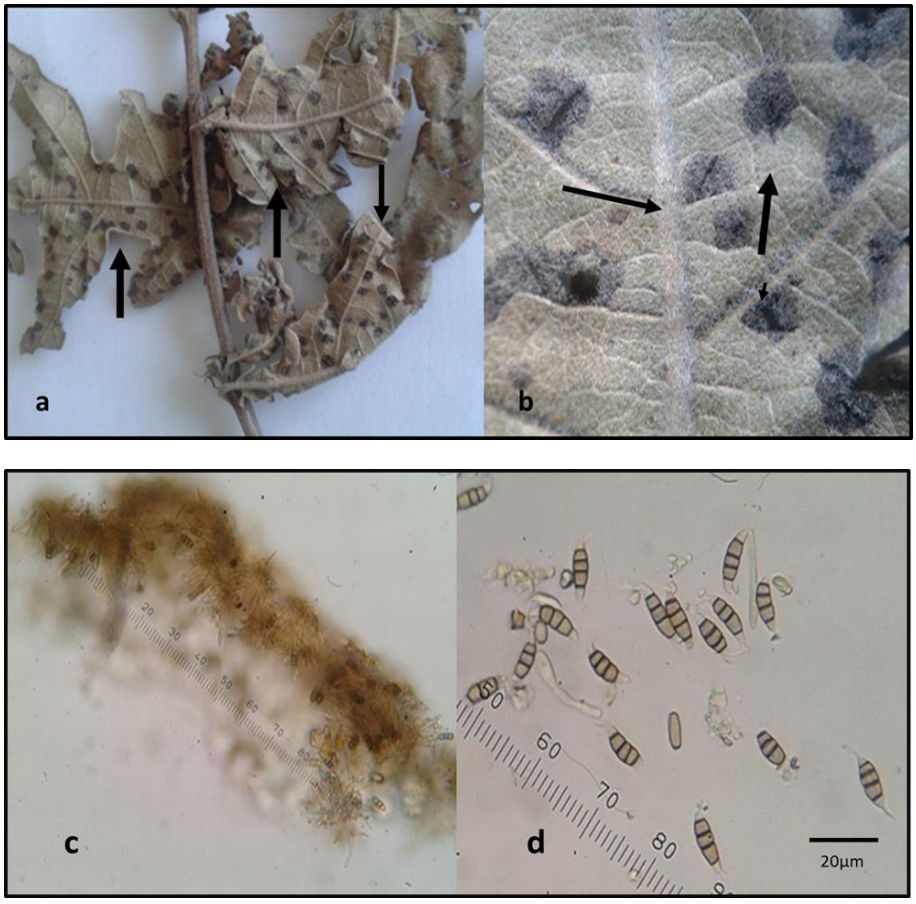

Figure 2. *M. monochaeta* on *Q. robur* **a.** Spots formed by fungus **b.** Stereo microscope images of spots **c.** Conidiophores **d**. Conidia

The genus *Monochaetia* is reported on various hardwood hosts in many parts of the world. These fungi cause spots on tissues, leaves, and stems [15]. *M. taphrinicola* (Ellis & Everh.) Sacc. & D. Sacc. is reported on *Q. alba* L., *Q. nigra* L., and other *Quercus* species in the USA; *M. sinensis* N. I. de Silva, Phookamsak, Maharachch. & KD. Hyde is reported on dead leaves of *Quercus* sp. in China; *M. karstenii* (Sacc. & P. Syd.)

B. Sutton is reported on infected leaves of *Camellia japonica* L. in India [13], and *M. quercus* F. Liu, L. Cai & Crous has been recorded on *Q. eduardi* Trel. in Mexico [4]. Other records are as follows: *M. bicornis* (Durieu & Mont.) Sacc. & D. Sacc. has been recorded on *Q. coccifera* L. in Algeria and on *Q. nobilis* hort. ex K. Koch in Mexico; *M. hysteriiformis* (Berk. & M. A. Curtis) Guba has been recorded on *Q. nigra* L. in South Carolina and *Quercus* sp. in Georgia; *M. ilicina* (Sacc.) Nag Raj has been recorded on *Q. ilex* L. and *Q. pubescens* Willd. in Italy [3,4].

M. monochaeta is distributed in Asia, Europe, and North America and usually infects the host plant's living leaf tissues and stems [15]. It has been found originally on wilting and dry leaves of *Quercus ilex* L. in France, on dead areas on living leaves of *Rhododendron linearifolium* Siebold & Zucc. in Japan, on leaves of *R.* sp. in the USA and on *Castanea crenata* Siebold & Zucc. in Japan [4,15]. Besides, it is reported on *Q. robur* in the Netherlands; on *Q. pubescens* Willd. in Italy; on *Q. ilex* L. and on *Q. rubra* L. in France; on *Q. variabilis* Blume in China and Japan; on *Q. agrifolia* Née in California; on *Castanea crenata* Siebold & Zucc. in Japan; on *Acer rubrum* L. in North Carolina; on *Arbutus menziesii* Pursh. in Canada, on *R. macrosepalum* in Japan, and *Rhododendron* sp. in Washington [14,15].

In Türkiye, *M. monochaeta* has been recorded on *C. sativa* Mill. (Kastamonu) and *M. veneta* (Sacc.) Allesch. has been recorded on *Cornus mas* L. (Kastamonu) [6]. With this study, the endophytic fungal pathogen *M. monochaeta* is reported for the first time on *Q. robur* from Anatolia (Türkiye) [10-15].

4. Conclusion

Fungal diseases, which can be easily transmitted when they find suitable hosts, cause severe damage to both wild and cultivated plants worldwide. Diseases that occur in flowers, fruits, leaves, roots, or sometimes the whole plant cause significant yield losses and, thus, severe economic losses. Agricultural products, such as cereals, trees, and landscape plants, are the leading ones. Considering the ecological and economic importance of plant pathogenic fungi, it is observed that research studies in this field are pretty insufficient. Therefore, it is thought that studies in this field should be increased in our country and worldwide. Furthermore, studies that start with species identification based on morphological and molecular genetic methods should be continued with biological control studies, considering human and environmental health.

Author Contributions

All the authors equally contributed to this work. This paper is derived from the first author's master's thesis, supervised by the second author. They all read and approved the final version of the paper.

Conflict of Interest

All the authors declare no conflict of interest.

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