



Powdery mildew on *Ulmus carpinifolia* in Tabriz, East Azerbaijan, Iran

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Abstract

Ulmus species are commonly planted as ornamental trees in many countries including Iran. During late October and November 2015, signs and symptoms of a powdery mildew disease were observed appearing for the first time on *Ulmus carpinifolia* in the campus of the University of Tabriz (East Azerbaijan Province, Iran). Based on morphological characteristics, the pathogen was identified as *Erysiphe ulmi* var. *ulmi-foliaceae*. This study provides the first report on the occurrence of this fungus in East Azerbaijan Province.

Key words – elm – ornamental tree – powdery mildew – *Ulmus carpinifolia*

Introduction

Ulmus species are commonly planted as ornamental trees in urban and rural areas in many countries including Iran. Members of this genus are also used in wood industry, medicine, food, etc. Powdery mildews are common fungal disease of angiosperms worldwide (Dixon et al. 1978). In a survey of foliar disease of elm trees in the campus of the University of Tabriz, Iran, heavily infected elm trees (*Ulmus carpinifolia*) with powdery mildew disease were observed. White mycelium was mainly observed on the adaxial leaf surface with abundant chasmothecia as small black to brown spherical structures. We describe the causal agent and provide an update on powdery mildew diseases of *Ulmus* spp. in Iran.

Materials & Methods

Isolates and morphology

During October–November 2015, the upper leaf surface of *Ulmus carpinifolia* growing in the campus of the University of Tabriz (East Azerbaijan Province, Iran) were found to be covered by powder-like fungal masses. Infected leaves were collected in paper bags. Fungal masses along with chasmothecia were separated from the collected samples with the help of a sterile pointed needle. Slides were prepared and examined using an Olympus–BX41 light microscope. Microscopic observations were recorded, 20 measurements were made for each microscopic structure where possible and 95% percentiles were calculated for the measurements with the extremes given in

parentheses. Photographs were captured using an Olympus digital camera system (DP 25) and software to analyze photographs.

Results

Symptoms of the disease include chlorotic to necrotic irregular leaf lesions. Signs include whitish mycelia along with chasmothecia that develop mainly on the surface of the leaves. Based on a combination of morphological characteristics and host-plant association, the fungus was identified as *Erysiphe ulmi* var. *ulmi-foliaceae* (Braun & Cook et al. 2012).

Erysiphe ulmi var. *ulmi-foliaceae* (Dzhaf.) U. Braun, Taxonomic Manual of the Erysiphales (Powdery Mildews): 590, 2012. (Fig 1)

≡ *Uncinula clandestina* f. *ulmi-foliaceae* Dzhaf., Bot. Mat. Otd. Spor. Rast., Bot. Inst. AN SSSR, 12: 266, 1959.

≡ *U. clandestina* var. *ulmi-foliaceae* (Dzhaf.) R.Y. Zheng & G.Q. Chen, Acta Microbiol. Sinica 18(1): 20, 1978.

≡ *Erysiphe clandestina* var. *ulmi-foliaceae* (Dzhaf.) U. Braun & S. Takam., Schlechtendalia 4: 18, 2000.

≡ *E. bivonae* var. *ulmi-foliaceae* (Dzhaf.) U. Braun & Minnis, Schlechtendalia 17: 56, 2009.

Ascomata (chasmothecia) scattered on the upper leaf surface, (60–)65–110(–120) μm diam., containing several (mostly 3 or 4) asci; appendages equatorial, evenly distributed, with curved apex, 15–35 μm , aseptate, hyaline, walls usually verruculose, rarely smooth, widening near the base, distally tapering. Asci 2-spored, broadly ellipsoidal, often almost globose, 40–55 μm . Ascospores hyaline, ellipsoid to obovoid, (15–)20–30 \times 10–20(–30) μm . On the host discrete white spots first appeared with dark brown to black chasmothecia later expanding and covering the leaves after a week (Fig. 1).

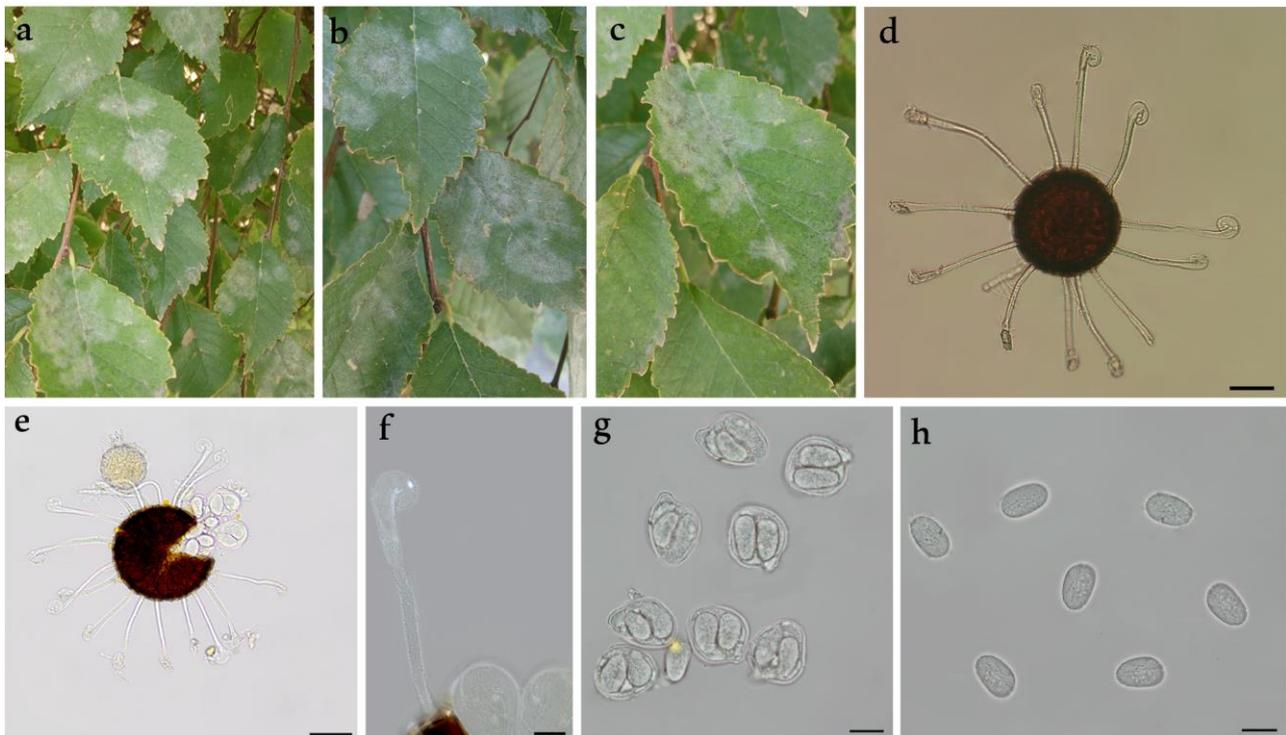


Fig 1– *Erysiphe ulmi* var. *ulmi-foliaceae*: a–c symptoms on *Ulmus carpinifolia* leaves, d–e chasmothecia, f appendage, g asci, h ascospores. - Scale bars (d–e) = 50 μm ; (f) = 10 μm ; (g) = 20 μm .

Discussion

The causal agent was identified as *Erysiphe ulmi* var. *ulmi-foliaceae* based on morphology. The morphology, as well as the host, is in accordance with published descriptions (Braun 1995, Braun & Cook et al. 2012). *E. kusanoi* var. *kusanoi* is a similar species on *Celtis* spp. and its var. *zelkovae* on *Zelkova serrata* in Eurasia with similar appendages (Braun et al. 1987). *Erysiphe kenjiana* first described as *Uncinula kenjiana* on *Ulmus pumila* from Manchuria (Homma et al. 1930), has spirally twisted appendages forming a helix of 1.5–2 coils distinctly enlarging the apical part on chasmothecia. The tips are uncinately-circinate and form a planar spiral (Homma 1930, Kravtsev 1950, Vasyagina 1961, Bunkina 1978, Braun 1987, Shin 2000, Heluta et al. 2009). Braun & Minnis (2008) clarified the nomenclature of this fungus that previously had been called *Erysiphe clandestina* Biv. [non (Wallr.:Fr.) Link]. To the best of our knowledge, this is the first report on the occurrence of a powdery mildew of *Ulmus carpinifolia* in East Azerbaijan Province of Iran, although *E. ulmi* var. *ulmi-foliaceae* has been reported on *U. carpinifolia*, *U. glabra* and *Ulmus* sp. in other provinces of Iran (Ershad et al. 2009).

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