

Diseases Caused by Fungi and Fungus-Like Organisms

Presence of Powdery Mildew Caused by *Erysiphe corylacearum* on Hazelnut (*Corylus avellana*) in Italy

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Hazelnut (*Corylus avellana*) is widely grown in Italy, which is the second world producer with 132,700 t harvested from 78,593 ha (FAO 2018). Powdery mildew caused by *Phyllactinia guttata* has been reported in Italy and in most European countries, but recently in Austria, Switzerland, and central Europe a new species has been found (Beenken et al. 2020; Voglmayr et al. 2020). During summer 2020, in Villar Fioccardo (Torino province, Piedmont, Italy) on hazelnut (cv. 'Tonda Gentile') growing on the edges of private gardens and parks, an extensive colonization of the adaxial side of the leaves with white powdery mycelium covering more than 80% of the surface was observed. Also, the abaxial side of the leaves showed the scattered presence of powdery, white, and thin mycelium. The fungus collected from leaves showed amphigenous, hyaline, branched, septate, 1.5 to 3.7 μm wide mycelium; lobed, solitary hyphal appressoria; vertically elevated above the mycelium 53 to 82 μm long and 5 to 12 μm wide conidiophores ($n = 30$); hyaline, ellipsoid, ovoid to doliform conidia, solitary on conidiophores, 21 to 36 μm long, 15 to 21 μm wide (average 28 to 18 μm) ($n = 50$). Chasmothecia appeared in late September 2020, and they were spherical, single or in groups, 83 to 138 (average 100) μm in diameter ($n = 50$); seven to 15 aseptate appendages were straight, sometimes flexuous, 55 to 111 (average 73) μm long ($n = 50$), with four to five times dichotomous branched apices and recurved tips. In each chasmothecium, there were three to five ellipsoid, ovoid to subglobose asci with a length of 41 to 60 μm and a width of 28 to 56 μm (average 52 to 44 μm) ($n = 30$). Asci contained four to eight ascospores, 15 to 26 μm long and 10 to 17 μm wide (average 19 to 12 μm) ($n = 50$). Mycelia were carefully collected by scraping them off with a scalpel, and the DNA was extracted by using the E.Z.N.A. Fungal DNA Mini Kit (Omega Bio-Tek, Darmstadt, Germany). Partial rDNA internal transcribed

spacer region (ITS) of two isolates (DB20SET01 and DB20SET02) was amplified using specific primers PMITS1/PMITS2 (Cunnington et al. 2003) and sequenced. Obtained sequences were deposited in GenBank (accession nos. MW045425 and MW045426). BLAST analysis of the obtained 749-bp fragments showed 100% identity to ITS rDNA sequences of *Erysiphe corylacearum* from Switzerland (MN822721) and Azerbaijan (LC270863). One-year-old plants of *C. avellana*, belonging to the cultivar Tonda Gentile, were artificially infected by dusting conidia from infected leaves. Inoculated plants were incubated under controlled conditions at $23 \pm 1^\circ\text{C}$ and 70 to 80% relative humidity. Typical symptoms (white bloom) appeared on the upper surface of the leaves at 8 to 10 days after inoculation. No symptoms were found on control plants treated with sterile water. The fungus isolated from inoculated leaves was morphologically identical to the original isolates from natural diseased plants. *E. corylacearum* causes a new and aggressive form of powdery mildew. Since the first observation in northeastern Turkey in 2013, it has spread rapidly throughout the Black Sea region, causing significant economic losses (Sezer et al. 2017). It has also been reported in Iran, Azerbaijan, and Ukraine (Arzanlou et al. 2018; Heluta et al. 2019). The disease has been observed sporadically in Piedmont, Italy, during summer 2020 (Regione Piemonte SFR and Agrion 2020) in some hazelnut growing areas without posing threat yet to the yield. This is the first report of *E. corylacearum* as an agent of powdery mildew on hazelnut in Italy. Such a finding suggests that this new powdery mildew may soon severely affect hazelnut groves in Italy and cause yield losses.

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