

## NEW DISEASE REPORT

# First report of *Erysiphe corylacearum* causing powdery mildew on *Corylus avellana* in Spain

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## KEYWORDS

emerging fungal disease, hazelnut, Tarragona

In the Mediterranean basin area, powdery mildew disease on hazelnut is commonly caused by *Phyllactinia guttata*. The disease occurs in late summer-autumn causing limited damage or economic impact. In April 2021, an unusual outbreak of the disease was observed on lower leaves of hazelnuts (cvs, Negret and San Giovanni) leading to rapid leaf desiccation in two commercial orchards (Camí de la Serra and Mas de la Coma), both located at La Selva del Camp, Tarragona, in north-eastern Spain. Unlike *P. guttata*, roundish spots of white mycelium appeared on the adaxial side of the leaves (Figure 1). Fruit was also infected and damaged.

Microscopical observation of the amphigenous mycelium found hyaline, branched, septate hyphae, and conidiophores producing single hyaline ellipsoid to doliform conidia ( $27.2\text{--}34.0 \times 17.0\text{--}23.8 \mu\text{m}$ ; Figure 2). Brown chasmothecia (diameter  $115\text{--}135 \mu\text{m}$ ) with appendages 3–5 times tightly and regularly dichotomously branched were absent at the time of leaf sampling but were produced on detached symptomatic leaves after about three weeks at  $27^\circ\text{C}$ . Chasmothecia contained obovoid to globose asci ( $42.1\text{--}53.6 \times 38.2\text{--}41.5 \mu\text{m}$ ), containing 6–8 ellipsoid ascospores ( $17.5\text{--}21.7 \times 10.2\text{--}12.0 \mu\text{m}$ ; Figure 3).

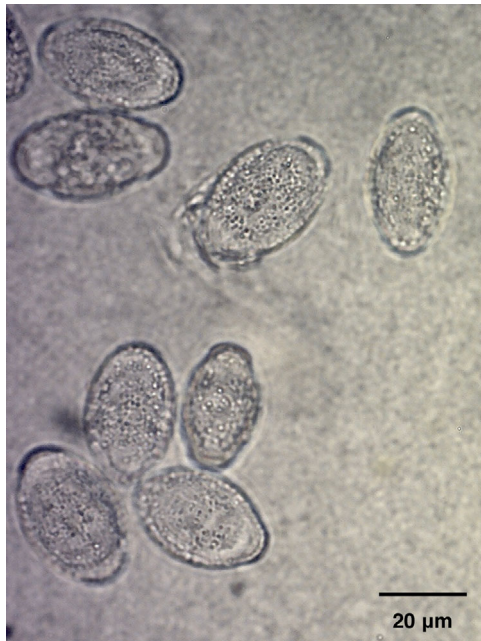
Symptoms and morphological characters aligned with the description of *Erysiphe corylacearum* (Bradshaw et al., 2021). The identification



**FIGURE 1** *Corylus avellana* cv. Negret heavily infected with powdery mildew

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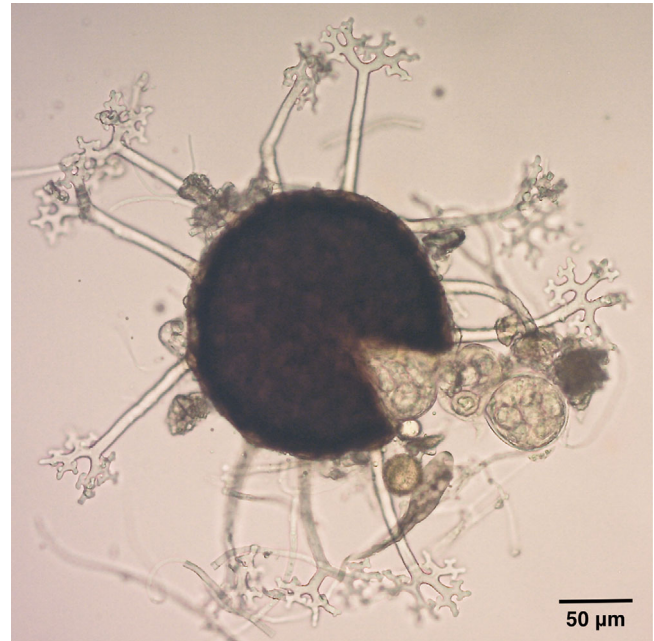


**FIGURE 2** Conidia of *Erysiphe corylacearum*

of three samples from different orchards was confirmed by amplification and sequencing of the ITS (PMITS1/PMITS2; Cunnington et al., 2003) and LSU regions (PM3/NL1/TW14; Mori et al., 2000) of the rDNA. The nBLAST analysis of these sequences (GenBank Accession Nos. MZ597855-MZ597857 for ITS; MZ597843-MZ597845 for LSU) revealed 100% identity to sequences of *E. corylacearum* (MW345726; MW031866; KX279887).

Young healthy leaves of hazelnut plants cv. Tonda Gentile were detached, and surface sterilised for pathogenicity testing. The leaves were inoculated by spraying a water suspension of conidia from diseased leaves ( $10^5$  conidia/ml) and incubated at 21°C under a 12hr light cycle. After 9–12 days, whitish mycelia with abundant conidia of *E. corylacearum* appeared on the leaves, whilst those inoculated with water as a control, remained healthy. Dry specimens are preserved at the fungal herbarium of University of Tuscia (ECESP1 – ECESP3).

To our knowledge, this is the first report of *E. corylacearum* causing powdery mildew on hazelnut in Spain. This species, known to infect *Corylus heterophylla* and *C. sieboldiana* in Asia (Bradshaw et al., 2021; Braun & Cook, 2012), was reported outside of Asia for the first time



**FIGURE 3** Chasmothecium of *Erysiphe corylacearum* with dichotomously branched appendages. Asci and ascospores are also visible

in 2013 causing significant yield losses on *C. avellana* in Turkey (Sezer et al., 2017). Since then, the disease has spread to eastern Mediterranean countries and towards western Europe, reaching northern Italy in 2020 (Mezzalama et al., 2021; Figure 4). This report shows that *E. corylacearum* has the typical traits of a severe invasive pathogen and is likely to represent one of the most serious threats for hazelnut cultivation in Europe.

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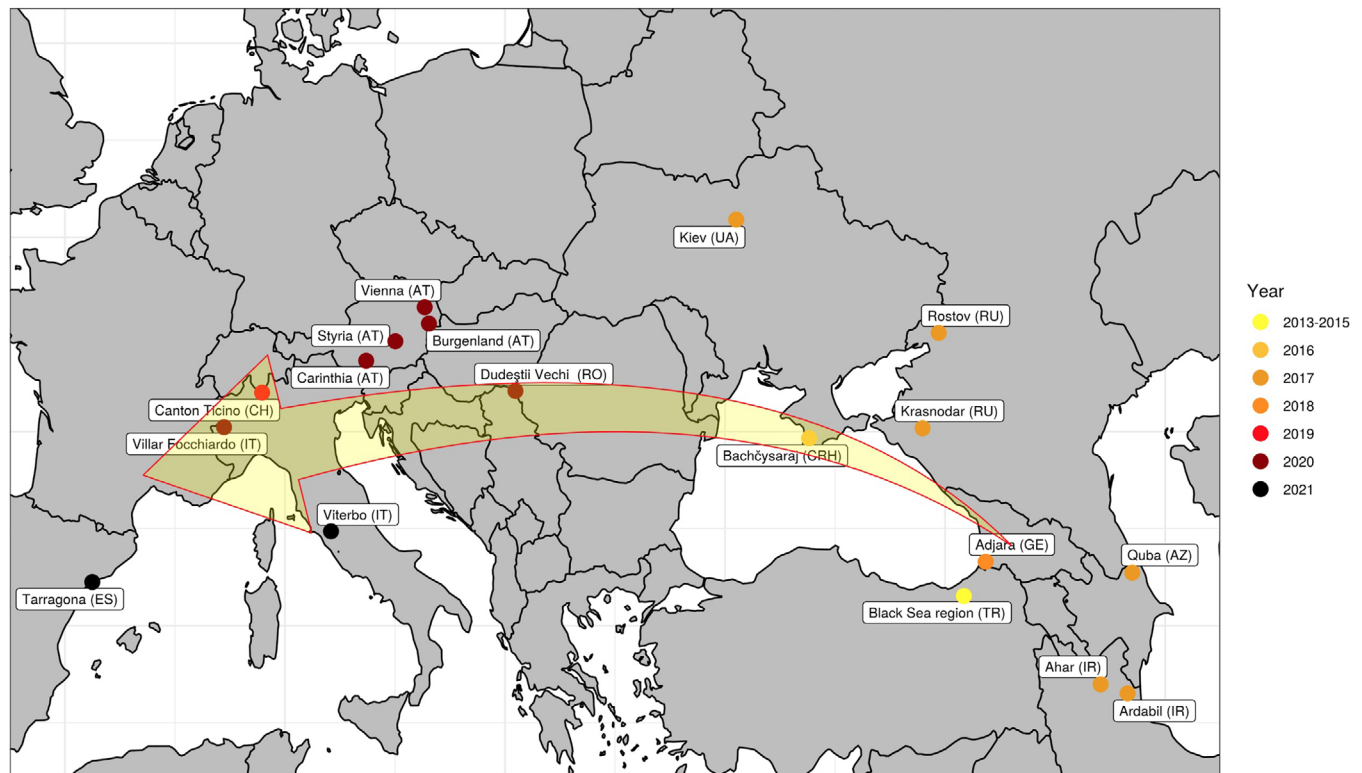
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**FIGURE 4** Map of *Erysiphe corylacearum* reports in Europe from Turkey (2013) to Spain (2021)

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