



# First report of *Phytophthora cinnamomi* associated with mortality of *Erica umbellata* natural shrubs in Spain

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*Erica umbellata* (dwarf Spanish heath), a small heather native to the western Iberian Peninsula and northern Morocco, is appreciated as a melliferous and ornamental plant. This species forms large shrub communities in western Spain, usually in association with *Calluna vulgaris*, *Pterospartum tridentatum* and *Halimium* spp. Several foci of heathlands dominated by *E. umbellata* showed decline and mortality in the Villuercas Mountains (Fig. 1), a protected natural area in eastern Extremadura (SouthwesternSpain) during 2009. A total area of about 10 ha was affected.

During spring 2011, roots and rhizosphere soil samples from *E. umbellata* plants exhibiting dieback and mortality were collected. Small roots were plated onto NARPH *Phytophthora* selective medium (Hüberli *et al.*, 2000) and incubated in darkness at 24°C. Soils were baited using seedlings of yellow lupin (*Lupinus luteus*). A *Phytophthora* sp. was consistently isolated from soil (8/11 samples) and roots (5/11 samples). Isolates were preliminarily identified as *P. cinnamomi* based on morphological and cultural traits. Isolates presented typical coraloid hyphae, hyphal swellings, thin-walled chlamydo-spores and non-papillate sporangia. In order to confirm the identification of the isolates, a nested PCR using specific primers was performed (Williams *et al.*, 2009). Furthermore, the ITS region of one representative isolate was amplified and sequenced using ITS6 (Cooke *et al.*, 2000) and ITS4 (White *et al.*, 1990) primers. The ITS sequence (GenBank Accession No. KF318044) showed 100% homology with *P. cinnamomi* (AY302174.1) when subjected to an NCBI BLAST search.

A pathogenicity test was conducted with one collected isolate of *P. cinnamomi* and 30 healthy potted *E. umbellata* plants collected from unaffected natural areas. Fifteen randomly selected plants were inoculated with V8 agar mycelial plugs (6 mm diameter) previously incubated for six days in soil extract to induce sporulation and the remaining 15 plants were used as controls. *P. cinnamomi* agar plugs were introduced into the soil at the level of the root system, while the control plants were treated in the same way with sterile plugs. The plants were maintained in a controlled environmental chamber (24°C, 60% RH, 14 h light) for four weeks and were waterlogged for two days per week. After 14 days, some inoculated plants showed general wilting and a yellow discolouration of the leaves starting at the bottom of the twigs. Finally, all inoculated plants died, whereas none of the non-inoculated plants showed any of the described symptoms (Fig. 2). *P. cinnamomi* was re-isolated from 60% of the plated root fragments obtained from the inoculated plants (n=50), while the pathogen was not isolated from the roots of the control plants (n=50).



Figure 1

The results of this work indicate that *P. cinnamomi* plays a role not only in the decline of oak woodlands in the Iberian Peninsula (Brasier *et al.*, 1993), but also in the mortality of large areas of natural heathlands, which should be considered in the management and afforestation programmes in these areas. To the best of our knowledge, this is the first report of *E. umbellata* as a natural host of *P. cinnamomi*. On the other hand, other *Erica* species of the Iberian Peninsula, including *E. arborea* and *E. lusitanica* have been found to be resistant to *P. cinnamomi* infection (Moreira & Martins, 2005).

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Figure 2

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