New Disease Reports

First record of smut caused by *Entyloma eschscholziae* on California poppy in the United Kingdom

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California poppy (*Eschscholzia californica*) is grown in UK gardens as an annual for its colourful display. In October 2012, diseased samples of California poppies (cv. Summer Sun) collected in a garden in Shropshire (West Midlands) were received at the advisory service at RHS Wisley. The plants were grown from seeds and about 80% of the plants were affected. Symptoms included white oval-shaped leaf spots surrounded by a dark border (Fig. 1). The spots were 1 mm in length or less on the lower and upper leaf surfaces and on the stems. The leaves became wilted and blackened. Microscopic examination revealed the presence of globose or polygonal hyaline to brown ustilospores measuring 8.3-14.8 x 7.2-12.8 µm (average 10.4 x 8.4 µm), wall 2-layered and 0.4-1.5 µm thick (Fig. 2). Long, filiform, slightly bent basidiospores measuring 24-62 x 2 µm (average 43.2 x 2 µm) were observed. According to Vánky (pers. com.), these have been observed in the genus *Entyloma* and, after or without conjugation, can produce secondary or tertiary sporidia. Sporidia were also observed and these were hyaline, cylindrical, mostly curved, unicellular, rounded at one end and tapered at the other end. They measured 9.4-16.5 x 2-3.6 µm (average 13.9 x 2.8 µm). The symptoms and the hyaline, densely aggregated spores embedded within the leaf tissue were characteristic of a smut fungus belonging to the genus *Entyloma*.

Morphological examination and host association of the fungus suggested it should be referred to *Entyloma eschscholziae* Harkness, the only species known from this host (Vánky, 2012). To obtain additional evidence, DNA was extracted from infected plant material using the Plant DNAeasy™ mini kit (Qiagen, Germany) according to the manufacturer's instructions. The ITS region was amplified using ITS 1F and ITS 4B primers (Gardes & Bruns, 1993) and sequenced (GenBank Accession No. KC456226). The DNA sequence was 100% identical to an uncultured Basidiomycota detected in grassland soils in California (HM240159). The sequence was also closely related to *Entyloma* species. The closest match to DNA sequences determined to the species level within GenBank was with *E. bidentis* (coverage 84%, 98% identity, AY854963) and *E. eryngii-plani* (coverage 84%, 98% identity, AY081034). Sequences of *E. eschscholziae* were not available in GenBank. In general, the molecular work carried out by Begerow *et al.* (2002) supported a species concept for the genus *Entyloma* based on host specificity. Altogether, based on the morphological characteristics, sequencing of the ITS and host specificity, the smut was confirmed as *Entyloma eschscholziae* (Harkness, 1884; Vánky 2012; Farr & Rossman, 2013). The original description of this species does not include an anamorph (Harkness, 1884; Vánky 2012) and although conidia were observed by Savile, (1946), these were not described. A voucher specimen was deposited at the Royal Botanic Gardens, Kew, UK (K(M)179304). A subsequent collection on this host from the Royal Botanic Gardens, Kew was obtained by A.M. Ainsworth on 22 Oct. 2012, accessed as K(M)179357. This is the first report of *Entyloma eschscholziae* causing smut in the UK and also in Europe. Until now, this disease has only been reported in California and New Zealand (Farr & Rossman, 2013).

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Figure 1

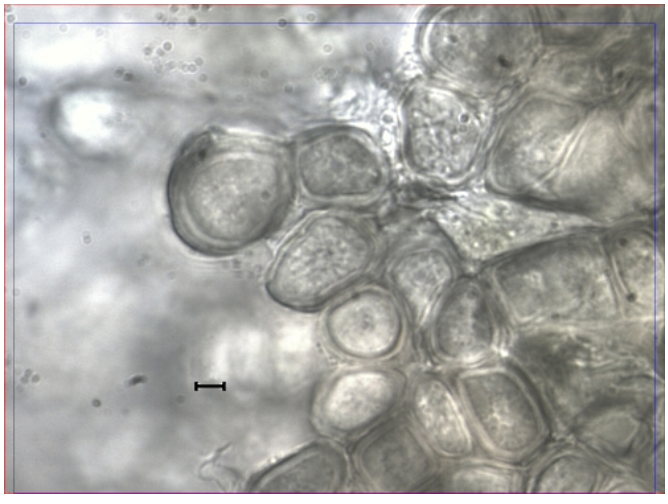

Figure 2

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