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Received 25 May 2011. Accepted 29 May 2011.

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DOI: 10.3366/anh.2011.0041

The Potato Late Blight pathogen in Ireland, 1846: reconnecting Irish specimens with the Moore–Berkeley correspondence

Preserved specimens of living organisms are frequently of greater scientific importance than was previously reckoned. The most significant ones hitherto have been those specimens that serve as nomenclatural types. However, increasingly sophisticated and sensitive techniques now permit scientists to study the genomes of preserved specimens of organisms revealing data about the origin and evolution of individuals, populations and species (in the present context, see Ristaino 1998, 2006; Ristaino *et al.* 2001).

One of the most devastating plant pathogens known is the fungus-like oomycete *Phytophthora infestans* (Mont.) de Bary, which causes late blight of potato (*Solanum tuberosum* L. agg.), and was the primary cause of famine in Ireland during the last half of the 1840s when millions of people died or emigrated. Research conducted during the 1980s suggested that the strain of *P. infestans* which destroyed the European potato crop in the late 1840s originated in Mexico (Goodwin *et al.* 1994). Subsequently, however, using the very small quantities of DNA which can be extracted from fragments of the pathogen preserved at the height of the historic epidemic (Ristaino *et al.* 2001; May and Ristaino 2004), work by Ristaino (JBR) and her colleagues has indicated that the Ia haplotype strain of the pathogen caused famine-era epidemics, contrary to previous assumptions. Further work with modern specimens indicated that the source of this oomycete was the Andes in South America (see Gómez-Alpizar *et al.* 2007).

A series of nineteenth-century dried specimens were sampled by JBR, including two preserved in the Mycological Collections, Royal Botanic Gardens, Kew (Ristaino *et al.* 2001: 695, Figure 1; Ristaino 2002: 1373, Figure 3D; 2006: 2, Figure 3C). Both¹ originated in Ireland at the Royal Dublin Society's Botanic Gardens, Glasnevin, and were collected in 1846 by the curator David Moore. Moore had sent these samples to the Reverend Miles J. Berkeley (see Nelson 1983, 1995) who in 1878 presented his entire mycological collection to the Royal Botanic Gardens, Kew, whence it was transferred in 1879 (Hooker 1879: 346). However, Berkeley retained his correspondence, and this was donated to the British Museum (Natural History) (now the Natural History Museum), in 1890, shortly after Berkeley's death (Sawyer 1971: 77). Thus, unwittingly, the specimens¹ of the disease (host with pathogen) that Moore had sent became divorced from the correspondence which provides their exact history.

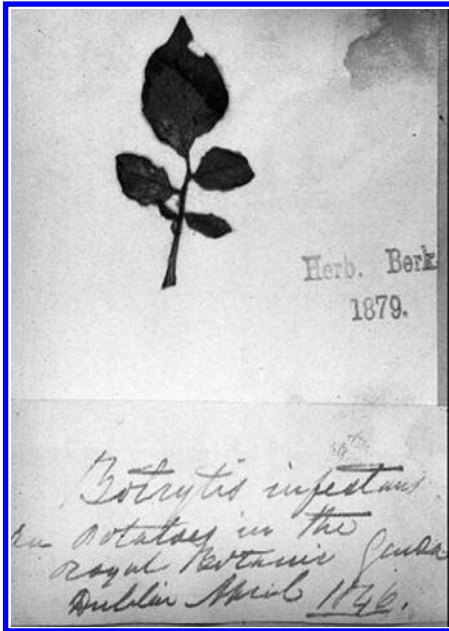


Figure 1. David Moore's specimen of a potato leaf infected by blight, collected in early April 1846 and annotated by him (this photograph has previously been published in Ristaino *et al.* 2001: 695, Figure 1; Ristaino 2002: 1373, Figure 3A; 2006: 2, Figure 3A; Ristaino *et al.* 2009: 37, Figure 1).

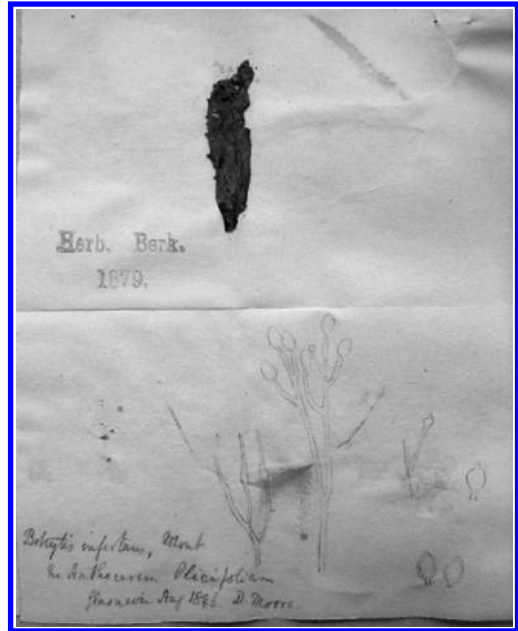


Figure 2. David Moore's specimen of a leaf from *Anthracium ilicifolia* killed by blight, collected in August 1846, with annotation and drawings by M. J. Berkeley (this photograph has previously been published in Ristaino 2002: 1373, Figure 3D; 2006: 2, Figure 3C).

The most significant letter to Berkeley was written by Moore on 17 April 1846²:

Dear & Rev^d Sir,

I feel specially obliged by your Kind condescension [*sic*] to inform me on the Potato Fungi as I requested. The *Psilonia rosea* has certainly aided very materially in hastening to decay any diseased potatoes, and, I have observed very particular that, it burst through the cuticle by the tuber from the interior, which is hardly the character of the genus | as defined by you in B^l Fl. The inclosed will show you that we are to have a visit from your friend *Botrytis* this season again.

By same post I send you a number of the 'Irish Farmer's Journal' which contains the principal details of a paper I lately read on the potatoe subject before our great annual agricultural meeting. | By the bye, are your fasciculi of dried Fungi to be had in London or elsewhere ? You would further oblige me by letting me know how many are published and how I shall get them if for sale.

I have the honor to be
Dear Mr Berkley
respectfully yours
D. Moore

"The inclosed will show . . ." referred to a potato leaf attached to a sheet of notepaper. This specimen (Figure 1), now in Kew, was labelled in Moore distinctive handwriting: "*Botrytis infestans* / On Potatoes in the / Royal Botanic Garde[n] / Dublin April 1846." It is clear from Moore's (1846a, 1846b) published accounts of the progress of late blight at Glasnevin during 1846 that the plant which yielded this leaf-specimen was cultivated in a glasshouse. Indeed, potatoes planted out of doors in Ireland would not have had well-developed foliage so early in the season, and certainly would not have had visibly infected leaves. This suggests

that the pathogen survived over the winter on disease tubers planted in the Glasnevin glasshouse.

The second specimen (Figure 2) which Moore forwarded to Berkeley later that same year was a leaf from *Anthocercis ilicifolia* A. Cunn., a shrubby member of the Solanaceae endemic to south-western Australia. Moore included this leaf in his letter dated 24 August 1846 (Nelson 1983: 255; 1995: 10, 12). The shrub from which this leaf came had been raised at Glasnevin from seed donated by G. W. Webb³ ([Hooker] 1845), and, remarkably, had been figured in December 1845 in *Curtis's botanical magazine* ([Hooker] 1845: tab. 4200; Nelson 1995: 12). *Phytophthora infestans* caused its death. Given that the Glasnevin plant of *A. ilicifolia* was seed-raised, it was certainly infected in Ireland, not in Australia (Ristaino 2002: 1373, Figure 3D; 2006: 2, Figure 3C). Thus, as noted elsewhere (Nelson 1982, 1995; Ristaino 2002, 2006), David Moore was the first botanist to recognize that *Phytophthora infestans* could attack plants of genera other than *Solanum*, just as he was the first to detect the disease on tomato (*Solanum lycopersicum* L.) (see Walker 1846; Nelson 1982, 1995).

NOTES

¹ The caption erroneously identified Dr John Lindley as the collector because the herbarium specimen label at Kew listed Dr Lindley as the collector. Lindley was a member of the government-appointed commission which enquired into the potato disease and reported in November 1845; his colleagues were Professor Robert Kane and Professor Lyon Playfair. Lindley, the only non-resident member, visited Ireland briefly during the enquiry but is not known to have collected plant specimens, and, in any case, that visit took place in the autumn of 1845, not in 1846.

² Original ms in Botany Department, Natural History Museum, London (see Nelson 1983).

³ Seeds were the Swan River Colony (as Western Australia was then generally known) were received at the Glasnevin Botanic Gardens in July 1842 and September 1843 (Accession records; original ms in National Botanic Gardens, Glasnevin, Dublin); the early lot is more likely to have been the source of this species.

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Received 25 May 2011. Accepted 7 June 2011.

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DOI: 10.3366/anh.2011.0042

CORRIGENDUM to *Archives of natural history* volume **38** part 1

E. C. Nelson and D. M. Porter, Archibald Menzies on Albemarle Island, Galápagos archipelago, 7 February 1795.

Two of the notes for the Appendix, numbered 29 and 31, on p. 111 and p. 112 respectively, were reversed and should read:

29 Narborough Island.

31 Probably the volcanoes of Alcedo, Sierra Negro or Cerro Azul on Albemarle Island.