



## Real-time PCR diagnostics: a tool for managing soil-borne potato diseases

Jennie Brierley<sup>1</sup>, Alison Lees<sup>1</sup>, Daan Kiezebrink<sup>2</sup>, Stuart Wale<sup>2</sup>, James Woodhall<sup>3</sup> Jeff Peters<sup>3</sup>

<sup>1</sup> *The James Hutton Institute, Invergowrie, Dundee, DD2 5DA, Scotland, UK*

<sup>2</sup> *SAC Aberdeen, Craibstone Estate, Aberdeen, AB21 9YA, UK*

<sup>3</sup> *The Food and Environment Research Agency, Sand Hutton, York, YO41 1LZ*

### Abstract

In recent years, quantitative diagnostic assays based on real-time PCR have been developed for many pests and pathogens of potato. These diagnostic assays are now being used in conjunction with refined methods for the direct extraction of soil DNA to enable soil-borne inoculum of pathogens to be both detected and quantified. The assays are an essential tool with which unresolved questions in the epidemiology of potato diseases, including blemish diseases such as black dot (*Colletotrichum coccodes*) and powdery scab (*Spongospora subterranea*), can be studied. To enable real-time PCR diagnostic assays to be used not only for research purposes, but also to be applied directly for the management of potato diseases, it is necessary to relate quantitative diagnostic results with the associated risk of disease. We describe how this relationship has been elucidated through a comprehensive system of soil sampling, testing and disease monitoring and experimental work both in the field and controlled environment, focusing on two examples; black dot and powdery scab. The effect of soil inoculum level and its interaction with disease control measures including host resistance, soil moisture (irrigation), crop duration and chemical control on the incidence and severity of disease has been determined. This work highlights how, with proper validation, real time PCR diagnostics can be an important component of disease management strategies.