



# First report of a new binucleate *Rhizoctonia* on potato tubers in the UK

J.W. Woodhall<sup>1\*</sup>, K.M. Webb<sup>1</sup>, G. Harper<sup>2</sup>, J.C. Peters<sup>1</sup>, M. Rodriguez-Carres<sup>3</sup> and M.A. Cubeta<sup>3</sup>

<sup>1</sup> The Food and Environment Research Agency (Fera), Sand Hutton, York, YO41 1LZ, UK; <sup>2</sup> AHDB Potato Council, Sutton Bridge Crop Storage Research, Sutton Bridge, Spalding PE12 9YD, UK; <sup>3</sup> Department of Plant Pathology, North Carolina State University, Raleigh, NC 27695-7616, USA

\*E-mail: james.woodhall@fera.gsi.gov.uk

Received: 12 Mar 2011. Published: 29 Jun 2011. Keywords: elephant hide, anastomosis group, rDNA ITS sequencing

A sample of potato tubers of cv. Navan displaying growth cracking (up to 10 mm in depth and width) and elephant hide symptoms often associated with *Rhizoctonia* potato disease were received by Fera for diagnosis. The tubers, originating from a commercial farm in Cornwall UK, were harvested in October 2009. For each symptom, pure *Rhizoctonia* cultures were obtained as previously described (Woodhall *et al.*, 2007) and DNA was extracted from the resulting cultures and tested for *R. solani* anastomosis groups (AGs) 2-1, 3, 5, and 8 using real-time PCR (Budge *et al.*, 2009). AG-3 was consistently found from tuber areas showing severe elephant hide, sunken areas and growth cracking symptoms. However, isolates consistently recovered from areas of less severe elephant hide symptoms, which often covered as much as 50% of the tuber surface (Fig. 1), could not be assigned to a specific AG by this method.

To determine the identity of these isolates, the hyphae of one representative isolate was stained with trypan blue in lactoglycerol (0.1% stain made with 67ml lactoglycerol, 33ml distilled water and 0.1g trypan blue) to visualise nuclei. Under 400x magnification, each cell had two nuclei indicating the strain was a binucleate *Rhizoctonia* species (BNR). The mean width of 20 mature hyphae was 5.1  $\mu\text{m}$  (range 3.81 to 7.63  $\mu\text{m}$ , s.d.= 0.89  $\mu\text{m}$ ) and consistent with BNR species. Since previous studies have demonstrated the utility of DNA-based assays to identify AG in the absence of tester isolates for typing, sequencing of the rDNA ITS region was undertaken for the isolate with primers ITS1 and ITS4 (White *et al.*, 1990). The resulting sequence (GenBank Accession No. FR828480) was compared to other sequences in GenBank. No near identical matches were found suggesting the isolate could be a unique strain of a particular BNR or belong to a previously undescribed AG. The isolate was therefore deposited into the Fera culture collection as Accession No. cc43.

To determine whether the isolate was the causal agent of the observed symptoms the following experimental protocol was carried out. Potato minitubers (cv. Santé) were placed at 100 mm depth in 2 litre pots with John Innes Number 3 compost. Three 10 mm PDA plugs from a 14-day-old culture of the isolate were placed on top of each minituber. Pots were held in a controlled environment room at 18°C with 50% relative humidity and watered as required. After four weeks, plants were removed and assessed for disease. Small lesions ( $\leq 5$  mm) were present on roots and stems (Fig. 2). Infected lenticels and similar mild elephant hide

symptom were present on the seed tuber. BNR was consistently isolated from symptomatic tissue.

Here, we report the finding of a previously undescribed strain of BNR occurring in a UK potato crop. This is the first account of an infection of potato caused by *Rhizoctonia* other than *R. solani* in the UK. *R. solani* has been associated with *Rhizoctonia* potato disease in UK potatoes, with a number of different isolates assigned to AGs 2-1, 3 and 5 (Chand & Logan, 1983; Woodhall *et al.*, 2007). We further demonstrate the ability of this isolate to cause disease on potato roots and stems. Future work on *Rhizoctonia* potato disease in the UK should also consider examining the relative contribution of BNR to the epidemiology of *Rhizoctonia* diseases of potato.

## Acknowledgements

The authors thank support from the AHDB Potato Council, UK.

## References

- Budge GE, Shaw MW, Colyer A, Pietravalle S, Boonham N, 2009. Molecular tools to investigate *Rhizoctonia solani* distribution in soil. *Plant Pathology* **58**, 1071-1080. [doi:10.1111/j.1365-3059.2009.02139.x]
- Chand T, Logan C, 1983. Cultural and pathogenic variation in potato isolates of *Rhizoctonia solani* in Northern Ireland. *Transactions of the British Mycological Society* **81**, 585-589. [doi:10.1016/S0007-1536(83)80129-6]
- White TJ, Bruns T, Lee S, Taylor JW, 1990. Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. In: Innis MA, Gelfand DH, Sninsky JJ, White TJ, eds. *PCR Protocols: A Guide to Methods and Applications*. New York, USA: Academic Press, Inc., 315-322.
- Woodhall JW, Lees AK, Edwards SG, Jenkinson P, 2007. Characterisation of *Rhizoctonia solani* from potato in Great Britain. *Plant Pathology* **56**, 286-295. [doi:10.1111/j.1365-3059.2006.01545.x]



Figure 1



Figure 2

**To cite this report:** Woodhall JW, Webb KM, Harper G, Peters JC, Rodriguez-Carres M, Cubeta MA, 2011. First report of a new binucleate *Rhizoctonia* on potato tubers in the UK. *New Disease Reports* **23**, 31. [doi:10.5197/j.2044-0588.2011.023.031]

©2011 The Authors

This report was published on-line at [www.ndrs.org.uk](http://www.ndrs.org.uk) where high quality versions of the figures can be found.