RISK ASSESSMENT FOR THE TRANSMISSION OF DICKEYA SPP. FROM THE PROCESSING OF INFECTED IMPORTED WARE POTATOES IN N. IRELAND

G.K. Young, L.R. Cooke, C.C. Fleming, B.P.M. Moreland, P. Nugent and R.E. Swan

Agri-Food and Biosciences Institute, Newforge Lane, Belfast BT9 5PX

Are Dickeya spp. a threat to potato production in N. Ireland?

- *Dickeya* spp. are non-endemic to N. Ireland

- Potential threat against competitiveness of the seed industry

- *D. solani* is considered to be more aggressive than *Pectobacterium* spp. at high temperatures

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Aims of project

- Survey imported and home-grown ware tubers for processing for the presence of *Dickeya* spp.

- Survey water sources: test samples of waste water from processing factories and river water every 3 months from summer 2012 to 2014

- Investigate the aggressiveness and survival of *Dickeya* spp. compared with endemic species of blackleg- and soft rot-causing bacteria in N. Ireland

Determine the risk from *D. solani* in imported ware potatoes to potato production in N. Ireland

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Aim 1: Survey imported and home-grown ware tubers for processing for the presence of *Dickeya* spp.

Source	Compliance Rate	Sampling Rate
Potato seed		
Imported Seed (all countries except Scotland)	100%	600 Tubers (3 x 200 tubers) per stock
Imported Seed from Scotland	25%	200 Tubers
NI Seed 1 stock from every seed grower	100%	200 Tubers
Growing Crop		
Imported seed (all countries except Scotland)	100%	Up to 5 stems with typical blackleg symptoms per crop
Imported Seed from Scotland	25%	Up to 5 stems with typical blackleg symptoms per crop
NI-origin Seed		Up to 5 stems with typical blackleg symptoms per crop
Post-harvest sampling		
Post-harvest sampling of crops from imported stocks (except Scotland)	100%	600 Tubers (3 x 200 tubers)
Post-harvest sampling of crops from imported Scottish stocks	25%	200 Tubers
Post-harvest sampling of ware stocks from farms known to have planted imported seed of high-risk origin	100%	200 Tubers
Post-harvest sampling of crops planted with NI-origin seed	5%	200 Tubers

Aim 1: Survey imported and home-grown ware tubers for processing for the presence of *Dickeya* spp.

Ware Crops for processing		
Source	Compliance Rate	Sampling Rate
Large pre-packers/processors of potatoes on own premises.	100%	200 Tubers Wash Water sample twice / year
Large Importer and distributor of potatoes for processing mainly by others on their premises.	100%	200 tubers (1 x 200) /3month
Smaller scale pre-packers / processors of potatoes on own premises.	100%	200 Tubers Wash Water sample once / year
Smaller scale importer and distributor of potatoes for processing mainly by others on their premises.	100%	200 (1 x 200) tubers/6 month

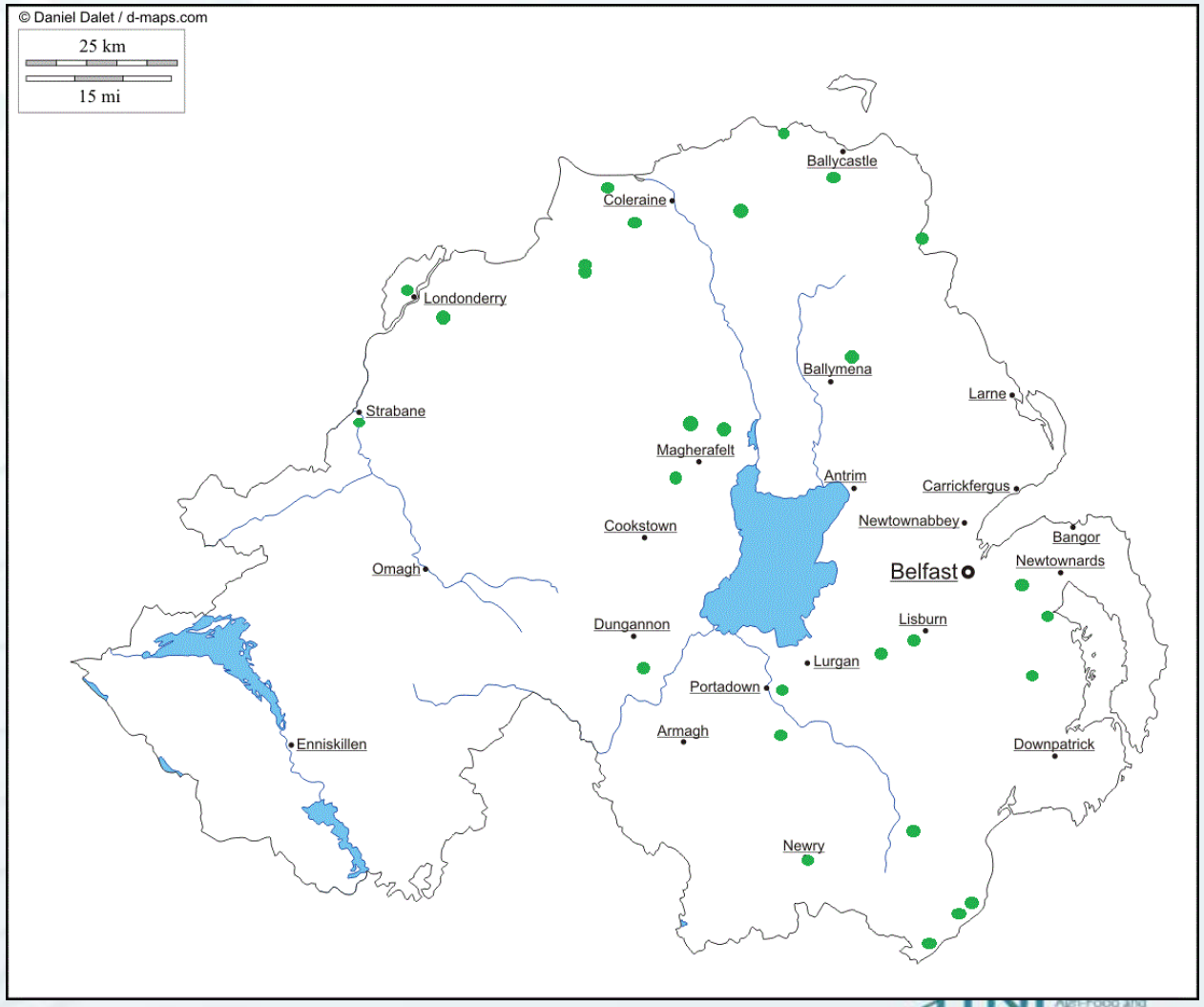
Aim 1: Survey imported and home-grown ware tubers for processing for the presence of *Dickeya* spp.

2010-2013	Plants	Seed tubers	Ware tubers
Number of samples tested	72 (2010) 61 (2011) 119 (2012)	116 (2010 crop) 155 (2011 crop) 163 (2012 crop)	165 (2010 crop) 147 (2011 crop) 181 (2012 crop)
Number of high-risk samples tested (sources other than N. Ireland or Scotland)	14 (2010) 14 (2011) 22 (2012)	24 (2010 crop) 27 (2011 crop) 72 (2012 crop)	53 (2010 crop) 54 (2011 crop) 104 (2012 crop)
Number of samples positive for *Dickeya* spp.	1 (2010) 1 (2011) 0 (2012) Both Dutch varieties once-grown in England	2 (2010 crop) 0 (2011 crop) 0 (2012 crop) Both imported Dutch seed	4 (2010 crop) 2 (2011 crop) 0 (2012 crop) All from Dutch varieties once-grown in England or Cyprus

Aim 2: Survey water sources

Survey design

- **A list was obtained from DARD of every potato processor in N. Ireland – 28 in total**
- **Each processor was visited and samples taken once every 3 months**
- **The nearest waterway was also identified and sampled during the same week**
- **150 samples of been tested to date**



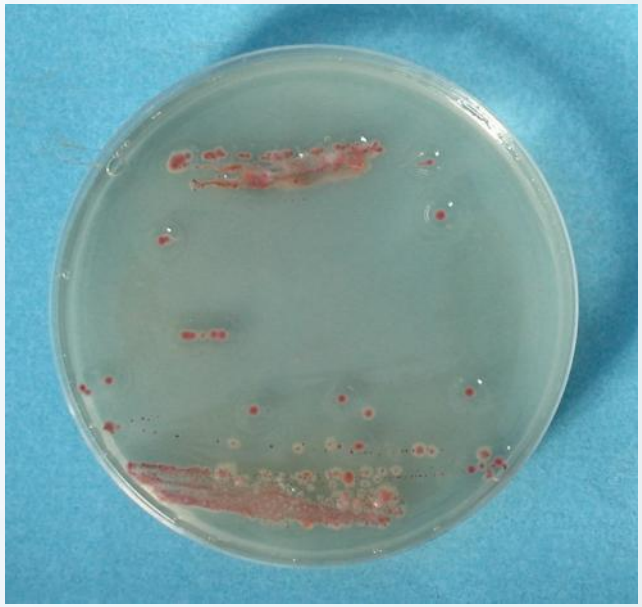
Aim 2: Survey water sources

First screen

- **Enrichment of material at 37oC**
- **PCR directly on sample**

Confirmation

- **Selective isolation of live bacteria**
- **Identification of bacteria using PCR**



Results

- **In 2012 only one (from a processing factory) tested positive for *Dickeya* spp., and this by PCR only**
- **In July 2013, one river tested positive for *Dickeya zeae*. The bacteria persisted for 3 weeks before dispersal**

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Aim 3: Investigate the aggressiveness and survival of *Dickeya spp.* compared with endemic species of blackleg- and soft rot-causing bacteria in N. Ireland

• Four bacteria of each strain sourced: *Pectobacterium carotovorum* subsp. *atrosepticum*, *Pectobacterium carotovorum* subsp. *carotovorum*, *Dickeya dianthicola* and *Dickeya solani*

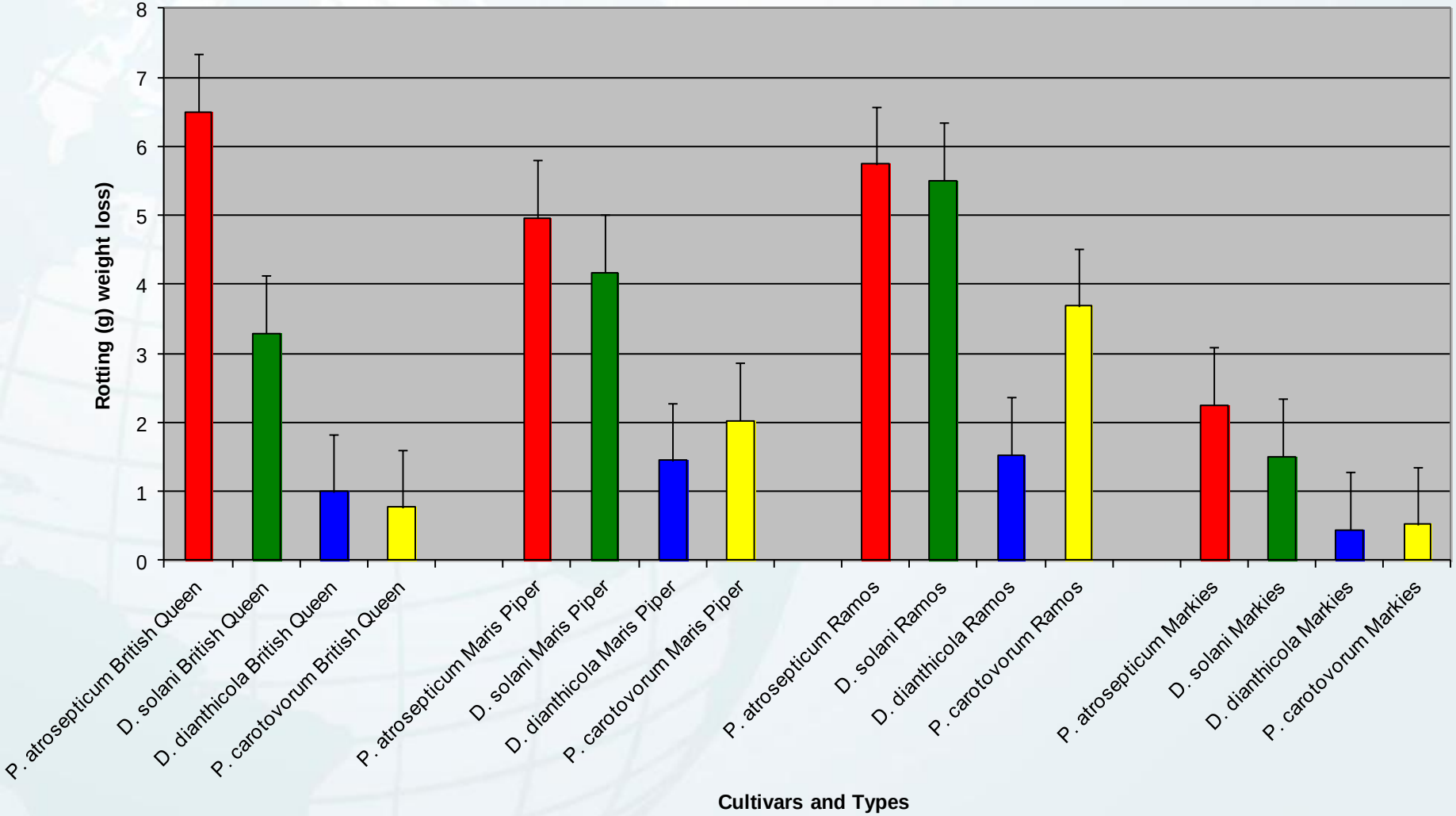
• A suspension of each (2 x 10^8 cfu/ml in sterile water) was incubated at 10, 15, 20, 25 and 30 oC for 24 hours

• Each suspension was inoculated into one tuber of four different varieties: British Queen, Maris Piper, Ramos and Markies and stored for 4 days at 22 oC

• A negative control of sterile water was used in each potato

• The experiment was replicated 3 times

Aggressiveness of different types of soft-rotting bacteria incubated for 24 hours at multiple temperatures



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Investigations into the survival of *D. solani* in potato waste water

•Preliminary investigations into the survival of *D. solani* have been completed in sterile water and processing water

•Experiments have shown that *D. solani* can survive and infect potatoes of Maris Piper after incubation in both sterile water and processing water for at least 3 days at temperatures from 0-20°C

•Further experiments over the next 2 months are planned to investigate survival in soil, potato peelings and potato boxes, before moving on to research on eradication

•Further experiments are also required to investigate aggressiveness of *D. solani* at low concentration levels and high temperatures, and as blackleg in growing plants

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Conclusions

- The risk from the spread of *Dickeya* spp. from the importing of ware potatoes must be considered to be low owing to lack of an inoculum source

- There may be a risk from the spread of *Dickeya* spp. in rivers, as *Dickeya* bacteria can survive for multiple days at low temperatures

- The comparative aggressiveness of *Dickeya* spp. with other endemic spp. at lower temperatures remains to be confirmed. These results would suggest that under high bacterial concentrations there is no difference between the aggressiveness of *Pectobacterium carotovorum* subsp. *atrosepticum* and *Dickeya solani*. However, further investigations are required to evaluate effect of bacterial concentration, temperature and infection method to further evaluate comparative aggressiveness

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Any questions?

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