Controlling bacterial diseases of potato: Research through to policy

Gerry Saddler
Outline

- The significance of bacterial threats – some general remarks

- A worked example: *Dickeya solani*
  - Background and the early indications of a growing problem
  - R&D: What we needed to know, who was involved etc.?
  - Our options
  - The solution and outcome

- Concluding remarks
There’s always something new…

- Trade liberalisation has increased the movement of crop pests and diseases, but it has also meant that cheap, year-round food is available
  - More than 30 potato pests and diseases are now present in GB and losses can account for 15% of our production

- There is constant pressure from new pests and diseases

- Difficult balance between preventing entry of further pests and diseases, costs of control measures and their impact on consumer choice and commodity price
Introduction of potato diseases into GB

Spread and control

- Bacterial disease can spread ‘vertically’ and ‘horizontally’
  - Vertical route: seed crop to daughter crop to grand daughter crop, etc.
  - Horizontal route: environmental or by direct contact

- Avoidance and control can be achieved using a combination of three elements
  - **Detection**: Intelligence about the level of threat
    • Present/absent, incidence within industry?
  - **Prevention**: Identify and block sources of infection
    • In general, most effective with the vertical route (seed)
  - **Sanitation**: After the outbreak has occurred to ensure no reoccurrence
    • In general, used to block horizontal spread (machinery, store, etc.)
Blackleg & soft-rot

- Blackleg is THE major cause of potato seed downgrading & rejections in Northern Europe

- Bacterial soft-rot of tubers can result in major production loss for both seed and ware growers (approx. ~10% in Europe)

- Blackleg and soft rot can be caused by
  - *Pectobacterium atrosepticum*
  - *Pectobacterium* spp.
  - *Dickeya dianthicola*
  - *Dickeya solani*
Dickeya solani: Quick facts

- A new, aggressive pathogen emerged in continental Europe ~ 2005-2006
  - causes wilting/blackleg and tuber soft rots
  - Reported in Belgium, Czech Republic, Finland, France, Georgia, Germany, Greece, The Netherlands, Norway, Poland, Spain, Sweden and Switzerland.
  - First detected in England in 2007 and in Scotland in 2009
  - In less than 5 years has become the predominant cause of blackleg in many European countries
R&D: What did we need to find out?

- How widespread was the pathogen?
  - Develop effective diagnostic method
  - Survey crops & environment

- Evaluate the risks of spread to home-grown GB seed potatoes
  - Determine routes of infection, survival in the environment, alternative hosts

- Assess the aggressiveness and risk of establishment
  - Response to temperature and humidity
  - Diversity of the pathogen
R&D: Who was involved?

- On the science side.....
  - Ian Toth, Leighton Pritchard & Sonia Humphris – James Hutton Institute, Dundee
  - John Elphinstone & Neil Parkinson - Fera, York
  - Greig Cahill, Rachel Kelly, Malgorzata Kowalewska & Karen Fraser – SASA, Edinburgh

- The supporting cast in policy and project management....
  - John Speirs, ARD, AFRC
  - Pieter van de Graaf, RESAS, ENFOR
  - Mike Storey & Sue Cowgill, Potato Council

- ....and the money....
  - Joint funding from RESAS and Potato Council
R&D: What did we find out?

- *Dickeya solani* has yet to establish in Scotland (GB?)
- Infected seed and not the environment is the principal infection route
  - Also found in irrigation water but limited
- Plant-to-plant spread under Scottish field conditions is inefficient
  - Survival on surfaces is poor and susceptible to all major disinfectants
  - Transmits easily from infected tubers to healthy ones during grading
- More aggressive than *P. atrosepticum* across a wider temp. range
- *D. solani* is clonal suggesting a recent introduction
- No evidence of resistance to *D. solani* in commercial varieties
So what could be done?

- Could existing tools be applied?
  - Seed classification scheme, specifically disease tolerances to manage problem (as already applied to control the indigenous *P. atrosepticum*);
  - Industry-led ‘Safe Havens’ scheme;
  - Scotland-specific tools (Community grade region, statutory notification of planting, separation of seed & ware, etc.).

- Could new approaches be adopted?
  - Establish *D. solani* as a quarantine organism in EU;
  - Ban potatoes imports from affected countries;
  - Develop UK legislation;
  - Develop Scottish legislation.
New Legislation
Publicising change

Scotland introduces strict new measures to counter Dickeya solani in Scotland’s spuds

Scottish may remove Dickeya infected seed

Scottish has introduced ‘nil tolerance’ on Dickeya solani to protect potato crops

Scottish farmers are being urged to keep seed potato holdings free of the aggressive blackening pathogen Dickeya solani as new tests for it are now up and running, says the Potato Council.
Scottish control programme

- Zero tolerance for all *Dickeya* species in the Scottish Seed Potato Classification Scheme from 2010

- Where *Dickeya* is found, no tubers from the crop will be permitted for planting

- All crop waste (including soil and brock) controlled to prevent further spread

- Ground keepers controlled in the affected field for two years

- All machinery and boxes which have been in contact with the stock to be cleaned and disinfected

- In the case of infested watercourses growers in the vicinity will be informed and localised irrigation bans may be imposed

- **It is illegal to plant seed potatoes infected with *Dickeya* spp. in Scotland**
Surveillance in Scotland

- **Pre-planting test for all non-Scottish origin seed potatoes (seed and ware production)**

- **All seed and ware planted with non-Scottish origin seed inspected for blackleg and lab tested when found**

- **All dangerous contacts (~ links to known positives, vicinity of infested water, etc.) inspected for blackleg and lab tested when found**

- **As above, for 10% sample of Scottish seed/ware crops**

- **Every irrigation source to be tested over a 3-year rolling programme**
  - Infested rivers sampled more intensively
Concluding remarks

- What do we now know about *Dickeya solani*....
  - Highly clonal, spreading quickly on seed, very infective, highly destructive, found in the environment and with a wide temperature range
  - In Scotland, has the potential to put growers out of business, could impact on seed exports and ultimately may affect price

- Government has played its part, but there are limitations...
  - Surveillance & control: Halted spread and blocked new outbreaks
  - Surveillance/sampling does not guarantee detection

- Industry/growers must also take measures to ensure we remain free of disease
  - Seed, equipment, containers, contractors, hygiene

- Only by Government and Industry working in partnership will we maintain freedom