Identification of factors which may be influencing the incidence of blackleg in Scottish seed potatoes

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SASA & AHDB Potatoes
Outline

• The Scottish Seed Classification Scheme
  – Blackleg trends, the causative organism and its impact across seed generations

• Factors which may influence blackleg incidence and severity
  – Previous history and environmental conditions
  – Other factors?

• Survey of pre-basic (PB) growers
  – Aims, key findings and corroborating evidence

• Conclusions and next steps
The Scottish Seed Potato Classification Scheme (SPCS)

Nuclear Stock
(pathogen-free microplants)
↓
Union grade PBTC
(microplants / mini-tubers)
↓
Union grade PB
(Up to 4 field generations)
↓
Union grade S
(Up to 5 field generations)
↓
Union grade SE
(Up to 6 field generations)
↓
Union grade E
(Up to 7 field generations)

Pre-Basic

Basic

Classes for Scottish Seed Potatoes
Faults recorded by field inspection of seed crops (2000 – 2014)
Seed area not holding grade due to blackleg (2000-2015)
Blackleg incidence in seed and its causative organisms in Scotland

<table>
<thead>
<tr>
<th>% seed stocks with blackleg</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>% blackleg caused by <em>D. solani</em></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>% blackleg caused by <em>D. dianthicola</em></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>% blackleg caused by <em>P. atrosepticum</em></td>
<td>93.8</td>
<td>96.3</td>
<td>95.5</td>
<td>96.4</td>
<td>96.8</td>
<td>95.2</td>
</tr>
<tr>
<td>% blackleg caused by other <em>Pectobacterium</em> spp.*</td>
<td>6.2</td>
<td>3.7</td>
<td>4.5</td>
<td>3.6</td>
<td>3.2</td>
<td>4.8</td>
</tr>
</tbody>
</table>

*, *P. carotovorum* subsp. *carotovorum* and *P. wasabiae*. Not tested for ‘*P. carotovorum* subsp. *brasiliensis*’
Blackleg by field generation (FG) 2011-2015
### Percentage of PB stocks infected by *P. atrosepticum*

<table>
<thead>
<tr>
<th>Grades</th>
<th>2013/14</th>
<th>2014/15</th>
<th>2015/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB1*</td>
<td>14 (57)†</td>
<td>2 (50)</td>
<td>20 (54)</td>
</tr>
<tr>
<td>PB2</td>
<td>50 (6)</td>
<td>33 (9)</td>
<td>33 (18)</td>
</tr>
<tr>
<td>PB3</td>
<td>44 (9)</td>
<td>60 (20)</td>
<td>65 (17)</td>
</tr>
<tr>
<td>PB4</td>
<td>100 (3)</td>
<td>100 (7)</td>
<td>0 (1)</td>
</tr>
</tbody>
</table>

*, PB1 equates with FG1, etc. †, Number of crops tested in brackets
Possible factors affecting blackleg in Scotland (1983-2013)
Blackleg Survey of PB Growers

Aim:
• Investigate social changes/industry practices with a view to identifying contributing factors which may be leading to a rise in blackleg, particularly in PB growers.

Methodology:
• One-to-one interviews based on a series of questions around social, financial and economic change

Analysis:
• In total 30 growers interviewed (28 from Scotland, 1 from Northern Ireland & 1 from England)
• QDA Miner qualitative data analysis software used to identify key themes
What are the main pressures on your business?
Changes to Scottish PB Production
What are the main factors driving disease development in crops?

<table>
<thead>
<tr>
<th>Code frequency for &lt;cases&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variety</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

The diagram shows the frequency of various factors contributing to disease development in crops. Each row represents a different factor, and the frequency is indicated by the size of the dot.
### Ranking of varieties: blackleg by area

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lionheart</td>
<td>Premiere</td>
<td>Swift</td>
<td>Charlotte</td>
<td>Charlotte</td>
</tr>
<tr>
<td>2</td>
<td>Premiere</td>
<td>Maris Bard</td>
<td>Fontane</td>
<td>Winston</td>
<td>Maris Bard</td>
</tr>
<tr>
<td>3</td>
<td>Charlotte</td>
<td>Winston</td>
<td>Premiere</td>
<td>Desiree</td>
<td>Estima</td>
</tr>
<tr>
<td>4</td>
<td>Sagitta</td>
<td>Slaney</td>
<td>Sylvana</td>
<td>Hermes</td>
<td>Winston</td>
</tr>
<tr>
<td>5</td>
<td>Winston</td>
<td>Cara</td>
<td>Charlotte</td>
<td>Estima</td>
<td>Valor</td>
</tr>
<tr>
<td>6</td>
<td>Slaney</td>
<td>Markies</td>
<td>Desiree</td>
<td>Cabaret</td>
<td>Desiree</td>
</tr>
<tr>
<td>7</td>
<td>Markies</td>
<td>Hermes</td>
<td>Hermes</td>
<td>Valor</td>
<td>Maris Peer</td>
</tr>
<tr>
<td>8</td>
<td>Maris Peer</td>
<td>Desiree</td>
<td>Estima</td>
<td>Cara</td>
<td>Cabaret</td>
</tr>
<tr>
<td>9</td>
<td>Hermes</td>
<td>Estima</td>
<td>Maris Peer</td>
<td>Maris Piper</td>
<td>Hermes</td>
</tr>
<tr>
<td>10</td>
<td>Desiree</td>
<td>Maris Piper</td>
<td>Maris Piper</td>
<td>Maris Peer</td>
<td>Maris Piper</td>
</tr>
</tbody>
</table>
What are the main factors that could be used to control or prevent blackleg from entering a crop?

<table>
<thead>
<tr>
<th>Code frequency for &lt;cases&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Varietal selection</td>
</tr>
<tr>
<td>No. of generations</td>
</tr>
<tr>
<td>Nutrition</td>
</tr>
<tr>
<td>Cold stores</td>
</tr>
<tr>
<td>Drying/curing seed after lifting</td>
</tr>
<tr>
<td>Improved storage</td>
</tr>
<tr>
<td>Field selection</td>
</tr>
<tr>
<td>Late planting</td>
</tr>
<tr>
<td>Optimal conditions for planting</td>
</tr>
<tr>
<td>Skin set</td>
</tr>
<tr>
<td>Early planting/early harvest</td>
</tr>
<tr>
<td>Hygiene (stores, grader, boxes)</td>
</tr>
<tr>
<td>Early burndown</td>
</tr>
<tr>
<td>Crop size (&lt;1ha)</td>
</tr>
</tbody>
</table>
Conclusions and next steps

• Factors affecting blackleg incidence and severity are numerous and complex!

• Clearly all businesses are under increased pressure: Could business size be an issue?

• In contrast to a widely held view there is no evidence to suggest that the recent increase is attributable to the current portfolio of varieties

• Although there is little consensus as to how we should improve blackleg management a number of avenues for further study have been identified

• Follow-up survey
  – Launch an online survey to all commercial growers based around key themes and issues (Aug 2016)
  – Final report with recommendations (Nov/Dec 2016)
Acknowledgments

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