

Resurgence of Bacterial Ring Rot in Idaho

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Bacterial Ring Rot

- *Clavibacter michiganensis* subsp. *sepedonicus* (Cms)
- First recognized in US in 1934.
- 37 states reported problems in 1940.
- Early research
 - Cutting knife experiment – Up to 24 pieces infected
 - Infected/healthy seed piece contact – 69% transmission
 - Surface contamination – 33% transmission



BRR Epidemiology

- Enters through wounds
 - Seed cutters
 - Pick planters
 - Handling
- Survives about 10 days in surface water
- Lives on material surfaces for > 2years
 - Iron, wood, rubber, plastic
 - Low RH, temps below 50 F (10 C)
- Does not survive in soil



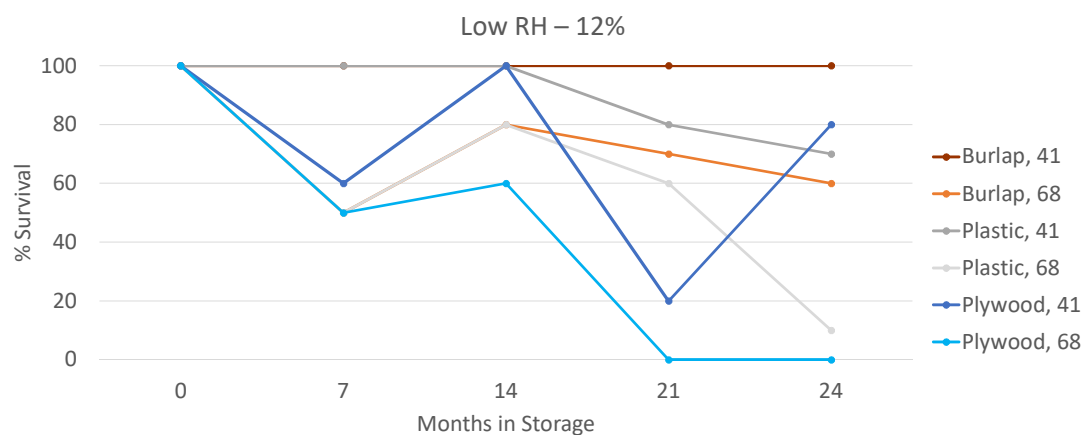
Where can BRR come from?

- Infected seed
- Infected culls (e.g. cattle feed)
- Contaminated equipment (e.g. trucks, seed cutter)
- Man/animals from a neighboring infected crop.
- Insufficient clean-up after a ring rot occurrence.
- Maintenance of latent infection on farm



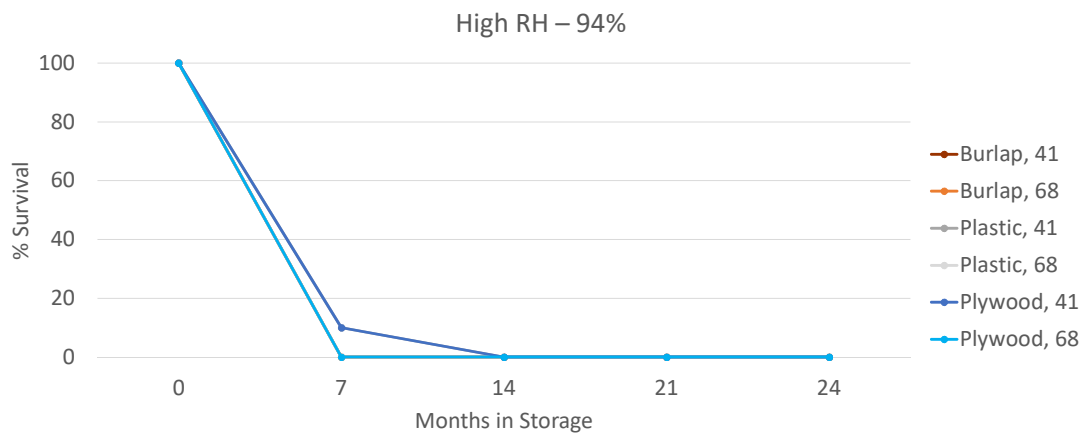
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Cms Survival



Nelson, 1980, American Potato Journal 57:595-600

Cms Survival



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Can BRR be eradicated?

- Early detection
- Sanitation
- Economic factors
- Commitment of entire industry

- Challenges
 - Cms persistence and latency
 - Inoculum potential

Difficulties in Detecting BRR

- Latent nature of disease.
- Nature of potato cultivation.
- Balance between practicality and accuracy.

BRR Testing

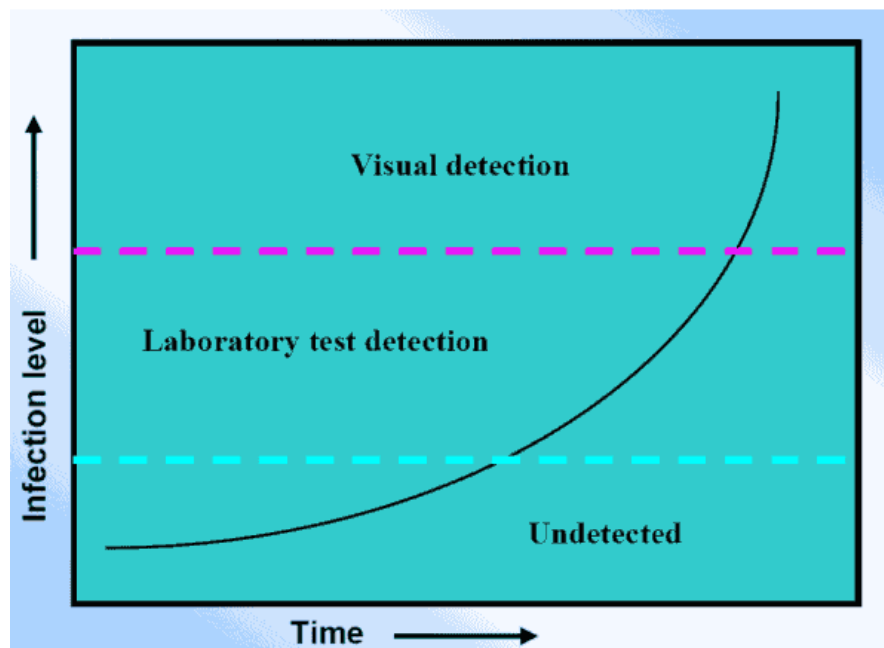
- Serological tests
 - Immunofluorescence (IFA)
 - Elisa
- PCR
 - Cms50/72a/85
 - Cea primer

Constraints of BRR Testing

- Testing cannot prove a lot is 100% clean.
- Extension of visual inspection.
- Sensitivity limited by sample size and quality of test.

- Positive test = Ring rot is present.
- Negative test = If infection is present, it is below detection level.

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BRR Testing Requirements – Idaho

- “A random sample of stems or tubers obtained from all seed lots G1 or higher, shall be laboratory tested for bacterial ring rot. The required testing must be completed prior to final certification. The minimum sample size shall be 10% of the stems or tubers to a maximum of 200 stems or tubers for seed lots 0.1 acres or less, and 400 stems or tubers for seed lots exceeding 0.1 acres.”

Idaho Crop Improvement Potato Certification Rules

Seed Certification

- Two summer field inspections
- Storage inspection
- Post harvest test
- Shipping point inspection

Idaho Seed Certification Standards

- “Bacterial ring rot, corky ring spot and root-knot nematode are zero tolerance factors. Any seed lot, regardless of generation, shall be rejected from certification at any time when any of these factors is confirmed by laboratory testing.”
- “A random sample of stems or tubers obtained from all seed lots entered for certification, G1 or higher, shall be laboratory tested for bacterial ring rot.”

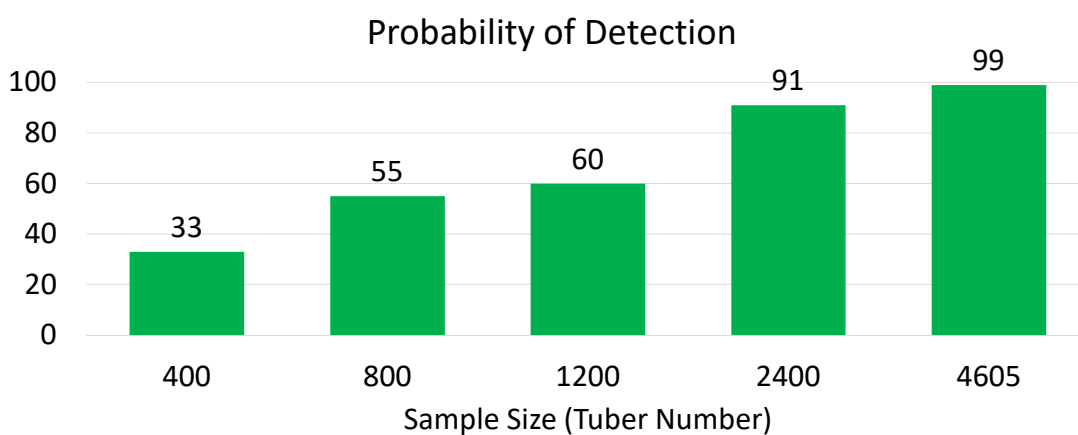
Idaho Seed Certification Standards - Land

- “A field will not be eligible to produce certified seed potatoes if noncertified potatoes or potatoes that have been confirmed to be Bacterial Ring Rot infected by a laboratory test were grown in this field the previous two growing seasons.”
- “A field must have been farmed with a crop other than potatoes immediately following the growing season in which potatoes were disqualified for Bacterial Ring Rot.”

Idaho Seed Certification Standards

- “All contact lots on a farming operation shall be ineligible for recertification if any lot of seed on that farming operation is rejected for certification because of bacterial ring rot.”
- Contact lots can be recertified – Negative 1200 stem/tuber sample
- Sister lots can be recertified – Negative 4400 stem/tuber sample

If BRR is present at 0.1% in a seed crop...



Clayton and Slack, APJ 65:711-723

Idaho seed growers exceed ring rot program requirements

In the first year of mandatory testing of Idaho certified potato seed for bacterial ring rot, many commercial growers have requested that their seed be tested at higher than minimum levels.

John O'Connell • Capital Press
Published on March 3, 2015 2:52PM



Can we do better?

- Are certification rules adequate?
- Improvement in sampling?
- Improvement in sanitation (cleaning)?
- Greater will for 0 tolerance?
- Improved sanitation with equipment handling seed?
 - Trucks
 - Cutters
 - Planters

Univ. of Idaho Extension CIS 1180

- <https://www.cals.uidaho.edu/edcomm/pdf/CIS/CIS1180.pdf>

University of Idaho Extension	CIS 1180
<p>Cleaning and disinfectant can help prevent spread of the following potato diseases</p> <p>In fields, spread by contaminated equipment Most problem pests can be effectively eliminated by removing all soil and debris from field equipment before they leave one field and enter another. Harvesters retain the most soil, followed by plows, and then cultivators.</p> <p>Pests that can spread include:</p> <ul style="list-style-type: none"> • Nematodes • Weed seeds • Soil-borne diseases 	<p>Cleaning and Disinfecting Potato Equipment and Storage Facilities</p> <p>By Nora Olsen and Phil Nolte</p> <p>Potato equipment and storages are exposed to a number of pests including fungi, bacteria, insects, nematodes, and weed seeds. Many of these pests can be spread from tuber to tuber or field to field on equipment or</p>

Cleaning/Disinfecting Equipment

1. Remove plant debris and foreign material
2. For storage: remove 1-2 inches of soil, replace with non-potato soil
3. Wash with soap and hot water or steam, rinse with water
 - Beware of biofilms!
 - Exposure to sunlight is helpful
4. Apply disinfectant to all surfaces – keep wet for 10 minutes
 - Labeled for porous and non-porous surfaces?
 - Labeled for storage or potato handling equipment?
 - Final rinse required?
 - Labeled only for seed facilities and equipment?

Adapted from U of I CIS 1180

Cleaning/Disinfecting Equipment (cont.)

- Ca and Na hypochlorites – corrosive on metal surfaces
- Hypochlorites and peroxides inactivated by organic matter
 - Not as effective on soil and wood
- Buffer chlorine-based products to pH 6.0-7.5
- For storage – disinfect for 10-15 minutes, close storage for 2 weeks

- Use of a storage service provider

Adapted from U of I CIS 1180

Common Chemistries

- Sodium hypochlorite
- Calcium hypochlorite
- Ammonium hypochlorite
- Chlorine dioxide
- Copper quinolinolate
- Quaternary ammonium
- Hydrogen peroxide and/or peroxyacetic acid mixtures

Adapted from U of I CIS 1180

Recent Disinfectant Research

- Tested NaOCl, H₂O₂, quaternary ammonium
- Tested on concrete, steel, rubber, polycarbonate, wood
- Biofilms more resistant than planktonic cells
- Biofilms
 - NaOCl = most effective on wood
 - H₂O₂ = most effective on steel
 - All disinfectants similar on concrete, rubber, polycarbonate surfaces

Howard et al., Can. J. Plant Pathol. 37:273-284