2014 Bacterial Ring Rot (BRR) Seed Lot Source Trial

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Background

Clavibacter michiganensis subsp. *sepedonicus* (Cms) causes bacterial ring rot (BRR) in potatoes. Foliar symptoms include wilting of leaves after midseason, usually the lower leaves, which can recover when soil moisture levels are improved. Leaves become pale green and are slightly rolled at the margins. As the disease progresses, pronounced wilting of the plant is apparent. The bacteria may cause symptoms in only one or two of the infected stems. Milky white bacterial ooze may be observed when the lower portion of the stem is squeezed. Symptoms vary by variety of potato. For example, other state certifying agencies have reported that 'Russet Burbank' may show a dwarf rosette. Symptoms of BRR often do not express until the latter part of the growing season, and generally are increased under hot, dry conditions. Asymptomatic infections also occur.

Tuber symptoms include discoloration of the vascular tissue, often an orange or red arc developing to the full blown classic symptom where the entire vascular ring is oozing white pus-like material. Symptomatic tubers can show external cracking and rot. These symptoms can be masked by the invasion of the tuber by other opportunistic organisms. Many tuber infections do not cause obvious symptoms.

Seed Lot Source Trial

Testing of tuber cores for Cms was offered to commercial growers by the Alaska Plant Materials Center. Six growers participated in the tuber core testing. Thirty lots were submitted, all of which were tested for Cms using real-time PCR (an extremely sensitive nucleic acid based technique). Three lots tested positive for Cms, of varieties 'Russet Norkotah', 'Cherry Red' and 'Pike'.

The Seed Lot Source Trial was planted at the UAF Palmer Center for Sustainable Living on June 4th, 2014, and consisted of the three infected lots, as well as twelve lots from three additional growers. Lots that were treated with sprout inhibitors were warmed prior to planting. Seed pieces were spaced on 12 inch drop in rows 6 feet apart. The planting was not irrigated and was under drought stress during most of the growing season. It was believed that the drought stress would produce more foliar symptoms, as vascular diseases often express stronger symptoms during hot or dry weather.

Plants were mostly emerged by July 3rd 2014 and were inspected for disease and pest issues during the growing season. Approximately 50% of plants emerged by mid July. The sprout inhibitor may be responsible for the poor emergence. 'Russet Norkotah' had 63 plants emerge, 'Cherry Red' had 93 plants and 'Pike' had 117 plants emerge.

Symptoms varied by variety. The infected 'Pike' were the first to show foliar symptoms. Symptoms observed on July 22nd included green wilt, stunting and a mild yellowing of the leaves in three of 117 plants. On August 18th three additional plants showed wilt and the beginnings of interveinal chlorosis.

Seven of 117 plants were symptomatic with strong interveinal chlorosis and wilt on September 2nd. Symptoms observed prior to August 18th were mild and could have been easily overlooked in a normal 36 inch row width planting due to compensatory growth of neighboring plants.

The 'Russet' Norkotah planting had 63 plants emerge. Two plants were observed to be wilting on July 22nd but had recovered and the wilt was not observed again until August 18th. Mild chlorosis was observed in one additional plant on August 18th. All 63 plants were senescent on September 2nd. No symptoms were apparent at this time.

The 'Cherry Red' planting had 93 plants emerge. On July 22nd one plant showed a dwarf rosette symptom. On August 18th one plant showed a green wilt symptom. On September 2nd one plant showed a mild interveinal chlorosis.

A few symptomatic plants of 'Pike', 'Russet Norkotah', and 'Cherry Red' were tested for Cms during the growing season. This consisted of cutting stems near the soil line, and then squeezing to express bacterial ooze, or laboratory testing by real-time PCR. Most symptomatic plants tested were confirmed to have BRR. This is considered destructive testing, since a stem must be cut from the hill to be tested. Because of this, relatively few stems were sampled. See also "2014 Bacterial Ring Rot Variety Inoculations".

Lots previously tested as tuber cores, and found negative for Cms, did not express BRR symptoms. Field testing of stems from these lots did not show bacterial ooze.

Time line

6/4 planting

7/3 emergence; sprout treated tubers 'Pike' 117 plants, 'R. Norkotah' 63 plants, 'Cherry Red' 93 plants

7/14 plants 4 to 6" tall, observed chemical damage, possible *Potato leafroll virus* (PLRV)

7/22 wilt symptom on several plants from 'Pike' and 'R. Norkotah', dwarf rosette in 'Cherry Red' (one plant)

8/5 Stunting observed in 'Pike'

8/14 mild chlorosis and wilt in 'R. Norkotah' and 'Pike'

8/18 wilt and chlorosis in 'Pike' (seven plants) and 'R. Norkotah' (three plants). 'Cherry Red' green wilt (one plant)

9/2 wilt and chlorosis in 'Pike' (six plants), chlorosis in 'Cherry Red' (one plant), all plants were wilted in 'R. Norkotah'

Benefits of the Seed Lot Source Trial and Recommendations for Detection of Bacterial Ring Rot in Seed Potato Certification

The identification of BRR infected tubers prior to cutting and planting enabled the growers to adjust their procedures to minimize the potential of infecting other potatoes.

The plot proved to be an excellent educational tool and easy to access for inspection staff. The seed lot samples were representative of what was observed on growers' farms during certification inspections. Several other diseases of note were found during the inspections of these lots. *Potato leafroll virus* (PLRV), *Potato virus Y* (PVY), and *Potato virus X* (PVX) were confirmed by ELISA (an antibody based test). *Alfalfa mosaic virus* (AMV, also known as Calico virus), Witches' Broom, Blackleg, and *Rhizoctonia* were also found. Disease symptom expression changed throughout the growing season.

Seed potato certification requires a minimum of two inspections. Certification inspections in Alaska are typically completed by mid-August as killing frosts have been recorded by this date. It appears from this experiment that symptoms of BRR often are not discernible until mid-August. Tuber core testing of a random sample from a seed lot provides another method of detecting BRR and eliminating diseased lots from being used for seed. Therefore, it is recommended that BRR testing, provided by the Division of Agriculture, would add another level of assurance that BRR was not identified in the seed lot.