

# Breeding for Resistance to Potato Cyst Nematode in the Russet Market Class

Two species of potato cyst nematode (PCN) are regulated pests in North America. Host resistance in potato offers the best long-term control of PCN, especially in the russet market class with no PCN resistance present in the more widely-grown varieties. Efforts and progress in incorporating PCN resistance from varieties from Europe, New Zealand, and South America into the russet market class are described.

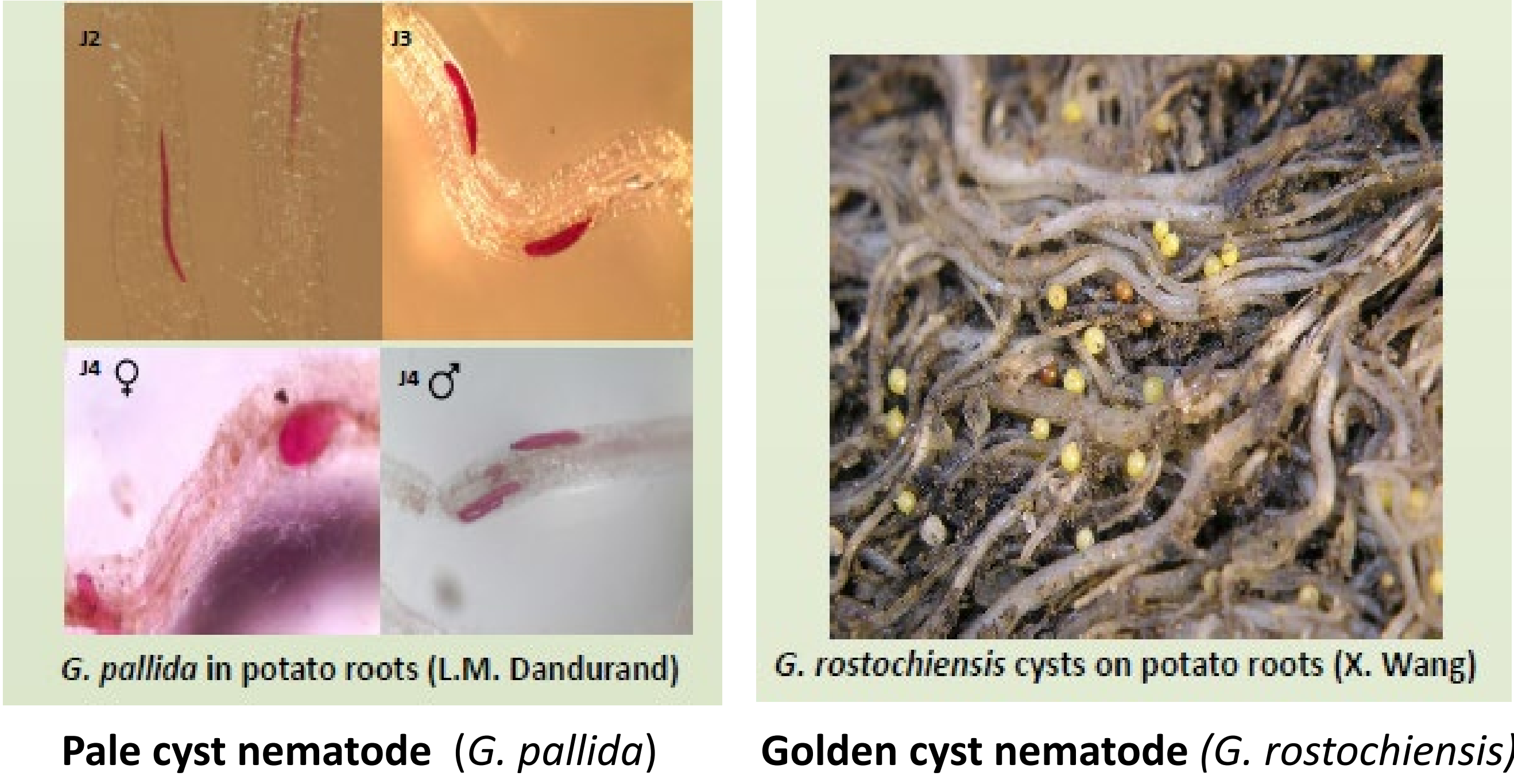
### Background

Two species of potato cyst nematode (PCN), (*Globodera rostochiensis* and *G. pallida*), have been identified in the U.S. and are regulated pests (**Figure 1**). The primary market class of potato grown in the western U.S. is characterized by varieties having long tuber shape and russet skin. The most widely-grown varieties in the russet market class do not have resistance to either PCN species. Potato varieties commercially available, having PCN resistance, typically have round tubers and white or yellow skin making them unsuitable for the russet market class. Hybridizations have been conducted between *Globodera*-resistant breeding clones and varieties to generate PCN-resistant progenies with the long tuber type and russet skin desired for fresh-pack and fry processing in the western U.S.

### Incorporation of PCN Resistance

An initial assessment of breeding germplasm maintained in the Aberdeen potato breeding program was conducted to identify potato varieties and germplasm having PCN-resistance, with an emphasis on resistance to *G. pallida*. Scottish variety, Eden, was identified as having moderate resistance to the *G. pallida* (Pa2/3) in Idaho, and high levels of resistance to *G. rostochiensis*. Successful hybridization was achieved between Eden and PCN-susceptible Western Russet for the generation of PCN resistant progenies in a family designated A10915 (**Figure 2**). Development of PCN resistant russet germplasm includes:

- Screening for response to PCN infestation by nematologists allowing the identification of PCN-resistant individuals.
- Using molecular markers associated with PCN resistance, thereby expediting the identification of resistant germplasm.
- Growing and selecting PCN-resistant germplasm in the field for desired russet-type and evaluating in field trials relative to industry standards.
- Intercrossing PCN-resistant Aberdeen breeding clones with PCN-resistant potato varieties and germplasm from Europe, South America, and New Zealand to pyramid *G. pallida* resistance loci, thereby generating higher levels of *G. pallida* resistance.



Potato Cyst Nematodes

- Cysts can survive ~30 years in absence of host
- Lower resistance available for Pale Cyst
- A race of Golden Cyst (Ro2) requires new resistance genes for control
- High yield reductions by PCN without soil fumigation
- Plant host resistance has been shown to be effective in the control of PCN

Figure 1. Background and photos of PCN species.

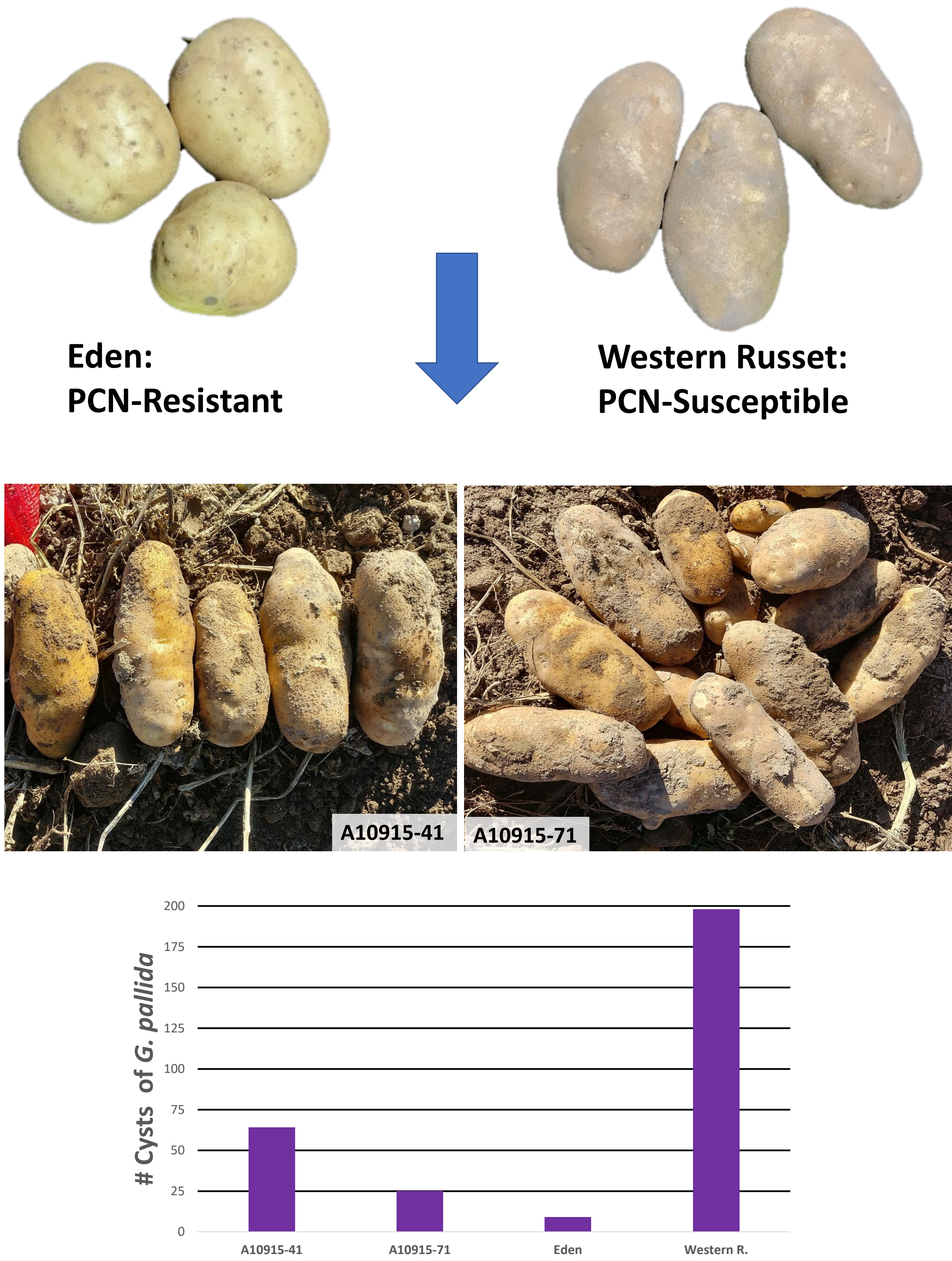


Figure 2. Intercrossing of *G. pallida* resistant ‘Eden’ with susceptible ‘Western Russet’ generated progenies (A10915-41 & -71) having the desired market characteristics of long tuber shape with russet skin and resistance to *G. pallida* and *G. rostochiensis*.



Figure 3. Two potato breeding clones in the 2023 yield trials of the Aberdeen potato breeding program with resistance to *G. pallida* and *G. rostochiensis*.

### Summary

- PCN-resistant varieties from Europe, New Zealand, and South America have been hybridized with Russets.
- Marker-assisted selection for PCN-resistance genes is employed and useful during field selection.
- Pyramiding of resistance genes to *G. pallida* is allowing for the development of higher levels of resistance.
- PCN-resistant hybrids with russet attributes are advancing in the Aberdeen potato breeding program (**Figure 3**).
- PCN-resistant russet varieties can be a component of an integrated approach for PCN management/eradication.

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