**Basic Information**

* **Project No. and Title:** [WERA89 : Potato Virus and Virus-Like Disease Management](https://www.nimss.org/projects/18280)
* **Period Covered:** 10/01/2018 to 09/30/2019
* **Date of Report:** 05/14/2018
* **Annual Meeting Dates:** 03/12/2020 to 03/13/2020

**Participants**

At the venue:

Teresa Almeida, Matthew Blua, Kasia Duellman, Robert Emmitt, Max Feldman, Ken Frost, Andrew Houser, Steve Hystad, Melinda Lent, Mark McGuire, Chris Mcintosh, Jeff McMorran, Sarah Noller, Julie Pasche, Alice Pilgeram, Silvia Rondon, Brian Ross, Kent Sather, Keith Schuetz, Lisa Tran, Eric Wenninger, Alan Westra, Adam Winchester, Lynn Woodell, Nina Zidak

Via internet connection: \*

Greg Elison, Jason Ingram, Andrew Jensen, Vamsi Nalsm, Mathuresh Singh, Kylie Swisher Grim, Johnathan Whitworth, Yuan Zeng

\*Participation was decreased due to the COVID19 pandemic and some opted to present or engage via the internet through Zoom.com

### Brief Summary of Annual Meeting

Attached file:

**Accomplishments**

1. Advances in dormant tuber testing for PVY (potato virus Y) and interpreting results is leading to more confidence in integrating this procedure into seed-potato certification systems. However, the industry is not yet at the point of replacing seed-lot grow outs.
2. Refining tuber testing for PVY is ongoing. An understanding of the uneven distribution of PVY in tubers is being accommodated by sampling tubers at four locations: stem end, heal end, and two eyes. Distribution of virions is also at the crux of determining the presence of tobacco rattle virus (TRV) and potato mop top virus (PMTV), which appear to be most often distributed in the stem end and heal end, respectively. Dormancy has also been shown to influence detection. Studies are currently being carried out to determine optimal sampling time after harvest.
3. Current tuber testing for PVY uses core sampling, immunocapture, and pressing the cores onto FTA cards that are later dried. FTA cards can be stored after pressing the samples onto them. Punches from these cards are combined in 25 sample composites and are processed with a high degree of automation to increase throughput. The ability to test for multiple pathogens from these samples simultaneously would provide a more cost-effective procedure. Immunocapture is more cost effective, but only detects a single virus.
4. A better understanding of aphid host-finding and appreciation for the complexities of their interaction with plants may lead to investigating another level of PVY control that involves blocking host-finding olfactory and visual cues, as well as studying the impact of stylet oils applied via aircraft and its interaction with sprinkler irrigation.
5. Investigations on powdery scab induced by *Spongospora subterranea* are yielding information. In controlled studies the fungicides Omaga (Fluzinam) and Ridez (biological extract) did not reduce powdery scab incidence, pre-harvest sporosori count did not correlate with PMTV development, soil inoculation increased with no or low disease incidence, disease incidence correlated with irrigation but soil inoculum did not.
6. Investigations on TRV / stubby root nematode interactions indicated that factors influencing Castle and Payette russet varieties resistance to TRV include virus isolate, nematode abundance, and soil type.
7. Studies indicated that TRV can be substantially reduced in soil by planting insensitive potato varieties or alfalfa. Further management includes managing nightshades, clean seed use, and sanitation.
8. Efforts to develop potato cultivars that are resistant to necrotic viruses have identified genetic markers associated with resistance. PMTV resistance in Castle Russet is polygenic (3-5 loci), while TRV resistance segregates as a single loci trait. Further studies will screen US Seed potato GenBank for PMTV resistance by a single dominant locus.
9. Economic studies focused on the value of the Montana seed-potato certification program to commercial potato growers in Idaho. It was concluded that cost of certification to Idaho growers using Montana seed is about $1 per acre. Without certification the cost per acre would be $205. Seed certification provided a value that exceeded its cost.

**Impacts**

1. Interaction among plant pathologists, vector entomologists, plant breeders, seed-certification specialists, and potato industry personnel identified knowledge gaps and areas of potential cooperation to develop multiple tactics to manage potato virus Y, potato mop top virus, and tobacco rattle virus.
2. State certification agency personnel from Colorado, Idaho, Montana, North Dakota, and Oregon reviewed their potato testing procedures and discussed changes in percentages of fields with PVY in their states as ascertained with dormant tuber testing and/or seed-lot grow outs. This provided researchers working in potato necrotic virus the opportunity to understand the value of their work to stakeholders. Conversely, the interaction allowed certification agency personnel a perspective of science that is providing crop-improvement solutions.
3. Grant-funding opportunities and strategies were discussed in detail and focused on procuring grant funds from stakeholder groups, including commodity commissions and associations, state programs including the Specialty Crop Block Grant program, and national programs including USDA/State partnership grants, USDA AFRI, USDA Commodity Board co-funding program, and USDA SCRI.

**Publications**

Chikh-Ali, M., Rodriguez-Rodriguez, M., Green, K.J., Kim, D.-J., Chung, S.-M., Kuhl, J.C, and Karasev, A.V. (2019) Identification and molecular characterization of recombinant *Potato virus Y* (PVY) in potato from Korea, PVYNTN strain. *Plant Disease* 103: 137-142 (<http://dx.doi.org/10.1094/PDIS-05-18-0715-RE>).

Cooper, W.R., Horton, D.R., Thinakaran, J., and Karasev, A.V. (2019) Dispersal of *Bactericera cockerelli* (Hemiptera: Triozidae) in relation to phenology of matrimony vine (*Lycium* spp.; Solanaceae). *Journal of the Entomological Society of British Columbia* 116: 25-39.

Cornejo-Franco, J.F., Alvarez-Quinto, R.A., Mollov, D., Karasev, A.V., Ochoa, J., and Quito-Avila, D.F. (2019) A new tymovirus isolated from *Solanum quitoense*: characterization and prevalence in two solanaceous crops in Ecuador. *Plant Disease* 103: 2246-2251 (<http://dx.doi.org/10.1094/PDIS-01-19-0113-RE>).

Dahan, J., Wenninger, E.J., Thompson, B.D., Eid, S., Olsen, N., and Karasev, A.V. (2019) Prevalence of ‘*Candidatus* Liberibacter solanacearum’ haplotypes in potato tubers and psyllid vectors in Idaho from 2012 to 2018. *Plant Disease* 103: 2587-2591 (<http://dx.doi.org/10.1094/PDIS-11-18-2113-RE>).

Gundersen, B., Inglis, D.A., Pavek, M.J., and Karasev, A.V. (2019) Foliar and tuber reactions of three strains of *Potato virus Y* on five fresh market potato cultivars through three successive potato generations. *American Journal of Potato Research* 96: 519-531 (<http://dx.doi.org/10.1007/s12230-019-09738-3>).

Inglis, D.A., Gundersen, B., Beissinger, A., Benedict, C., and Karasev, A.V. (2019) *Potato virus Y* in seed potatoes sold at garden stores in western Washington: prevalence and strain composition. *American Journal of Potato Research* 96: 235-243 (<http://dx.doi.org/10.1007/s12230-018-09695-3>).

Miglino, R., Kappagantu, M., van der Vlies, P., de Haas, J., Boomsma, D. and Pappu, H.R. (2019) Comparative transcriptome analysis of potato cultivars in response to Tobacco rattle virus infection. EAPR Plant Virology meeting. Estonia. June 25-28, 2019.

Pandey, B., Mallik, I., and Gudmestad, N.C. (2020) Development and Application of a Real-Time Reverse-Transcription PCR and Droplet Digital PCR Assays for the Direct Detection of Potato mop top virus in Soil. Phytopathology 110:58-67.

Rosenman, J., Christopher S. McIntosh, Giri Raj Aryal, Phil Nolte. (2019) “Planting a Problem – Examining the Spread of Seed-Borne Potato Virus Y” *Plant Disease*, Vol. 103 No. 9: <https://doi.org/10.1094/PDIS-11-18-2004-SR>.

Vologin, S.G., Zamalieva, F.F., Stasevski, Z., and Karasev, A.V. (2019) Occurrence of alfalfa mosaic virus in potato (*Solanum tuberosum* L.) in Middle Volga region of Russia. *Plant Disease* 103: 3289 (<http://dx.doi.org/10.1094/PDIS-03-19-0662-PDN>).

Wenninger, E.J., Dahan, J., Thornton, M., and Karasev, A.V. (2019) Associations of the potato psyllid and “*Candidatus* Liberibacter solanacearum” in Idaho with the non-crop host plants bittersweet nightshade and field bindweed. *Environmental Entomology* 48: 747-754 (<https://doi.org/10.1093/ee/nvz033>).

Zhai, Y., Mallik, I., Hamid, A., Tabassum, A., Gudmestad, N., Gray, S.M., and Pappu, H.R. (2020) Genetic diversity in potato mop-top virus populations in the United States and a global analysis of the PMTV genome. Eur. J. Plant Pathol. 156:333-342.