

SLVRC Pathology Program

Newsletter (June 2022)

Research updates and acknowledgements

Three research projects were funded by the Colorado Potato Administrative Committee on cultural practices to reduce the spread of potato virus Y in potato fields, and the effects of biopesticides on potato productivity and soil health. The Pathology Program appreciates the support by CPAC.

Thanks to Chad Price and Eric Hinton, with the Monte Vista Cooperative, for the generous biopesticide donations and recommendations. Thank you to Terrell Bogle, with the Plant Nutrient Solutions, for the donation of Pure Spray Green. Thank you to Dave West and Mark Inness for biopesticide donations.



Mohamad Chikh-Ali
PLANT PATHOLOGY PROGRAM LEADER
“I am excited to lead the Plant Pathology Program at the SLVRC starting from Jan 3rd, 2022. My research and extension programs aim to help growers to make educated decisions on the management of diseases of major crops, in particular potato.”

Plant Disease Diagnostic Lab

New equipment purchases were completed to provide the Pathology Program with the capability to perform greenhouse and lab-based assays to detect, identify and characterize potato pathogens, and diagnose potato diseases in the San Luis Valley.

So far about 200 samples were tested using more than 400 lab tests to diagnose fungal, viral and bacterial diseases. Various assays were used including bioassay*, ELISA**, PCR***, RT-PCR, IC-RT-PCR, qPCR and RT-qPCR.

The following pathogens were detected, and new isolates were added to our pathology isolate collection, including:

- ✓ Potato virus Y (PVY^O, PVY^{NTN}, PVY^{N-Wi})
- ✓ Potato moptop virus (PMTV)
- ✓ Tobacco rattle virus (TRV)
- ✓ *Phytophthora erythroseptica* (pink rot)
- ✓ *Verticillium dahliae* (verticillium wilt)
- ✓ *Pectobacterium atropeticum* (Black leg and soft rot)
- ✓ *Alternaria solani* (early blight)
- ✓ *Colletotrichum coccodes* (black dot)
- ✓ *Spongospora subterranea f.sp. subterranea* (powdery scab)
- ✓ *Rhizoctonia solani*

(see Page 2 for examples)

* *Bioassay relies on the interaction between plant pathogens and certain indicator plants. The symptoms observed may tell the identity of a plant pathogen. PVY^O induces mosaic symptoms in tobacco plants, while PVY^{N-Wi} induces vein necrosis symptoms, for instance.*

***ELISA, which stands for Enzyme Linked ImmunoSorbent Assay, is a protein-based assay that uses specific antibodies to detect pathogen proteins.*

****PCR, which stands for Polymerase Chain Reaction and its derivatives, are nucleic acid-based assays that amplify and detect target regions of pathogen genomes.*





Vascular discoloration caused by the fungus *Verticillium dahlia*, which has a wide host range and wide geographic distribution. *V. dahlia* causes verticillium wilt, potato early dying, and results in reduced potato yield along with affected tuber quality. It is a tuber- and soil-borne pathogen.
-Detected by qPCR

A potato tuber with soft rot symptoms caused by *Pectobacterium atropeticum*. *P. atropeticum* is the major cause of black leg and soft rot in the San Luis Valley.
-Detected by PCR



A potato tuber with corky ringspot symptoms caused by tobacco rattle virus (TRV). TRV has a wide host range and is transmitted by stubby root nematodes (*Paratrichodorus* and *Trichodorus* nematodes). TRV is of a serious concern to the quality of potato tubers.
-Detected by qPCR

A potato tuber showing necrosis caused by TRV and potato mop-top virus (PMTV). PMTV is transmitted by *Spongospora subterranea* f.sp. *subterranea*, the causal agent of powdery scab. The virus and its vector impact the quality of potato tubers.
-Detected by qPCR



Tuber lesion caused by *Alternaria solani*, the causal agent of potato early blight.
-Detected by qPCR

Powdery scab lesions caused by the protozoan *Spongospora subterranea* f.sp. *Subterranea* (Sss). Sss is the vector of potato mop-top virus. Sss cause tuber lesions and root galls which affects the yield and quality of potato crops.
-Detected by qPCR



Spore traps:

Three spore traps were deployed on May 7th in three farms in the SLV to monitor potato foliar pathogen population dynamics and spore dispersal trends during the growing season. Spore identity and quantity will be assessed using qPCR. This project will help to alert potato growers of major foliar potato diseases. Reliable and sensitive molecular assays are being used to identify and quantify trapped spores. We aim to develop a reliable disease prediction scheme to achieve efficient and low-cost disease management with less impact on the environment. For more information, please contact the Pathology Program at the SLVRC.



Featured disease: Stem Canker



Potato stem canker is caused by the fungus *Rhizoctonia solani*, which also causes tuber black scurf. The symptoms of stem canker appear as brown to reddish brown lesions on underground plant parts including stems, stolons and roots (see the Figure to the left). Infected crops show delayed emergence and reduced stand numbers. The disease restricts the movement of plant assimilates to the underground parts which may lead to the formation of aerial tubers. Other signs include plant stunting and upward rolling of the upper leaves with chlorosis. As of June 15, stem canker symptoms could be seen only if affected plants were pulled and no obvious symptoms could be seen on above ground parts of affected plants (Planting date May 5th). As potato plants continue to grow, plants with stem canker may show foliar symptoms mentioned above as the progress of stem canker blocks the assimilates from moving down to progeny tubers. Stem canker occurs mainly in cold and wet weather.

Seed and in-furrow fungicide treatments are available to growers. Cultural practices that ensure an accelerated emergence of potato plants after planting reduce the incidence of stem canker; these include shallow planting and planting in warm soil. Another good practice is to plant certified seed tubers with low levels of black scurf.

Figures to the left show stem canker symptoms (verified by qPCR).

For more information, please contact the Pathology Program at the SLVRC.

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