

Diagnostic optimization of viral detection and characterization of Potato virus Y for the Michigan seed potato certification program, 2025

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The MSU Potato and Sugar Beet Pathology (PSBP) program continues to work with the Michigan Department of Agriculture and Michigan Seed Potato Association to: 1) investigate detection options to identify accurate, timely, and cost-effective methods for use in Michigan seed potato certification, 2) monitor PVY strain and other tuber necrotic virus prevalence in Michigan seed potatoes, and 3) investigate PVY strain by chipping potato variety responses.

Materials & Methods:

In 2024, we shifted to using immunocapture-reverse transcription-polymerase chain reaction (IC-RT-PCR) (Chikh-Ali and Karasev, 2015) methods for faster and more cost-effective methods to screen for PVY in seed tubers. In 2025, IC-RT-PCR method is well adapted in Michigan. We will be continuing further research comparison for accuracy, efficiency, and cost effectiveness.

In 2025-26, an MDARD-MSPA awarded specialty crop block grant will support direct tuber testing and growout comparison in 80 seed lots from growers. In general, samples of 400 tubers were collected from each lot. Direct tuber testing with IC-RT-PCR was conducted in 10-tuber subsamples at least two weeks postharvest. Cored samples were then suberized and sent to Hawaii for planting and winter grow-out. Results from direct tuber and leaflet ELISA methods will be compared. Subsets of positive samples will be subject to PVY strain confirmation by RT-PCR (Chikh-Ali et al. 2013; Lorenzen et al. 2006, 2010; Mackenzie et al. 2015).

We also are repeating assays to assess PVY strain by variety responses (Gundersen et al. 2019). Based on Michigan survey observations, three chipping lines and varieties of interest were selected for repeat greenhouse experiments (Lamoka, NY163, and Manistee) and screened using three prevalent PVY strains (N-Wi, NTN, N:O) in a greenhouse assay. These experiments are currently in progress for 2025-26.

In 2023-24, a survey was conducted of PVY strain types from positive seed certification samples as well as of two other tuber necrotic viruses, Potato mop-top virus (PMTV) and Tobacco rattle virus (TRV) in Michigan using qPCR methods from Mumford et al. (2000).

Results & Conclusions:

- In 2024-25, PVY strain NTN was most prevalent, exceeding frequencies of strain N-Wi for the first time since our surveys began in 2019 (Figure 1A). Furthermore, 23% of samples were mixtures of NTN and N-Wi (Figure 1B).
- From two years of survey for PMTV and TRV in Michigan seed lots, only one positive sample was detected in 2023; however, positive tuber samples were asymptomatic and did not exhibit typical internal necrosis (Figure 2). This result suggests these viruses are not a major concern at this time but support continued monitoring in the future.

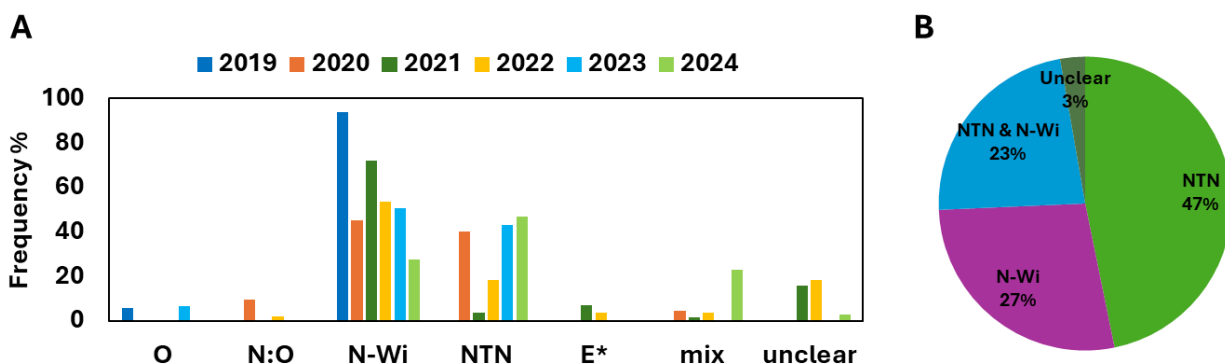


Figure 1. A) Representative PVY strains collected from Michigan potato seed certification program postharvest tests and B) breakdown of strains and strain mixtures in 2024-25. In 2020-21, N = 212 positives in 17,752 total samples. In 2021-22, N = 57 positives in 21,600 total samples. In 2022-23, N= 54 positives in 7,150 total samples. In 2023-24, N= 62 positives in 10,200 total samples. In 2024-25, N= 216 positives in 12,764 total samples. *In 2023, nine positive samples were included as N-Wi; Chikh-Ali et al. (2013) primers indicated suspect N-Wi but confirmation using Lorenzen et al. (2006) multiplex primers did not distinguish between N:O and N-Wi strains.

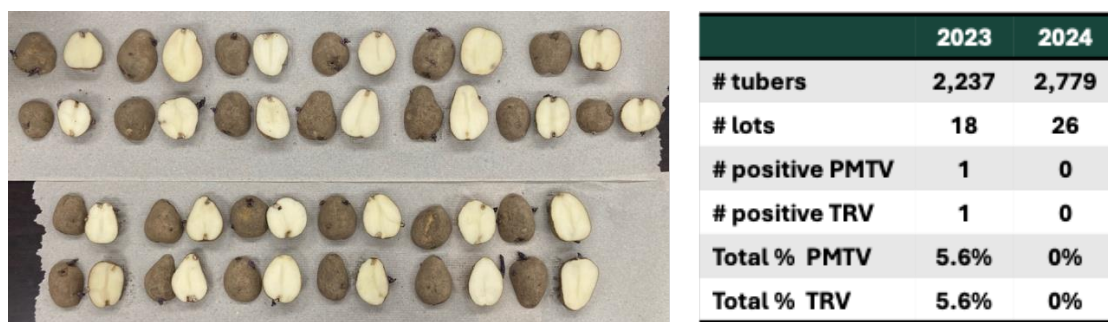


Figure 2. Survey of potato mop top virus (PMTV) and Tobacco rattle virus (TRV) in Michigan seed growing regions in 2023-2024. From 2023 and 2024, a total of 5,016 tubers representing 44 lots were screened for PMTV and TRV. In 2023, we detected one positive lot for both PMTV and TRV, however, this PMTV-positive sample was asymptomatic as shown above.

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