

# Summary of Potato Tuber Necrotic Virus (PVY, PMTV, TRV) Management Strategies

**PLEASE NOTE:** Additional details on these management strategies can be found at [blogs.cornell.edu/potatovirus](https://blogs.cornell.edu/potatovirus).<sup>1</sup> Please also see footnotes and links on pages 3 and 4.

## 1) Avoid introducing the viruses and their vectors onto your farm. This is your first and best line of defense.

- Don't plant the problem! Purchase the best certified seed potatoes to minimize PVY. Be aware that at this time certification does not specifically estimate PMTV or TRV in seed lots.<sup>2</sup>
- Select seed based on post-harvest test (PHT) estimates rather than summer inspection estimates (PVY). PHT estimates are more likely to detect late season infection and cultivars/PVY strains that exhibit mild or transient symptoms.
- Obtain PHT estimates based on lab testing rather than visual assessment (PVY). Lab testing is more accurate due to mild or non-existent foliar symptoms typical of some cultivars/PVY strains.
- Find out how many tubers were observed or tested for PVY to generate the PHT estimate. Larger sample sizes allow for the detection of virus at lower levels and are more accurate but are often not feasible. Be aware that the PHT only provides an estimate of the virus in a seed lot and that this estimate has an associated standard deviation that is not typically reported.<sup>3</sup>
- Do not plant seed potatoes with symptoms of virus-caused tuber necrosis. Inspect the seed you purchase for lesions and necrosis. Destroy affected seed and keep it out of your fields.
- Do not allow contaminated equipment onto your farm. Clean and sanitize all machinery and vehicles that may have come in contact with powdery scab (PMTV vector) and/or stubby root nematode (TRV vector) infested soils. This includes equipment that is borrowed or leased.<sup>4</sup>
- Avoid manure and compost from contaminated sources. Ensure these materials do not originate from potato debris or cull piles.
- Do not plant other susceptible and potentially infected crop hosts such as sugar beet, tobacco or bulb producing ornamentals such as gladiolus, daffodil, hyacinth and tulip (TRV)<sup>5</sup> or sugar beet, oat and tomato (PMTV).
- Test potting mix for powdery scab and PMTV before using it for minituber production and before planting minitubers on your farm. Send samples to a diagnostic lab for testing. A list of diagnostic labs can be found on the website.<sup>6</sup>

## 2) Manage inoculum levels on your farm.

- Monitor stubby root nematode/TRV and powdery scab/PMTV levels in your fields. Send plant, soil, potting mix and water samples to a diagnostic lab for testing. A list of labs can be found on the website.<sup>6</sup>
- Practice strict on-farm sanitation protocols to avoid spreading pathogens. Avoid moving contaminated soil, plant debris or manure to clean fields.<sup>4</sup>
  - All cutting and planting equipment should be disinfested before coming in contact with seed and between seed lots. PVY can also be transmitted in sap from an infected plant on hands and tools.

- Clean and sanitize all machinery and vehicles that have come into contact with symptomatic tubers or infested soils to prevent spread of pathogens to clean tubers and fields. Don't forget to include equipment belonging to temporary help, contractors and anyone else entering the infested field. Follow the same procedures when borrowing or leasing used equipment.
- Do not return culls or potato debris to the field, destroy this material instead.
- Avoid moving contaminated soil, plant debris or manure to clean fields.
- Contain water and soil run off/waste generated from washing tubers to avoid contaminating other fields. Do not irrigate clean fields with water that contains runoff from infested fields.
- Do not reuse bags or containers that have been used for potato transport unless they are clean and free of soil.
- Restrict movement of soil from infested fields with hedgerows or sod barriers between fields. Do not use headlands, farm or public roads as turning areas.
- Destroy overwintering sources of virus such as weed hosts and cull piles.
- Remove plants that can serve as a sources of inoculum.
  - Rogue or chemically kill volunteer potatoes early in the season.
  - Rogue infected potatoes often throughout the season. Early season roguing is especially critical.
  - Destroy weeds that serve as alternative hosts such as nightshade, lambsquarters, pigweed and purslane. See website for a list of alternative hosts under the "Management" section for each virus.
  - Utilize crop rotations as a way to chemically manage volunteers, e.g. follow seed production with wheat or another monocot so that broadleaf herbicides can be used to manage volunteers.
- Do not grow or rotate infested fields with other crop hosts such as sugar beet, tobacco or bulb producing ornamentals such as gladiolus, daffodil, hyacinth and tulip (TRV)<sup>5</sup> or sugar beet, oat and tomato (PMTV).
- Manage soil moisture especially during tuber initiation and early bulking phase (PMTV). Irrigate consistently to prevent wet/dry cycles. When possible, reduce hill moisture by avoiding broad, rounded hills. Reduce soil compaction by periodic deep cultivation. Avoid over-cultivating in order to decrease build-up of fine tilth that won't drain quickly.
- Manage powdery scab and stubby root nematodes with chemicals as part of an integrated management plan. Check with your local extension or university office for up-to-date recommendations.
- Use sorghum-sudan grass as a green manure with plow down prior to fall/winter to reduce powdery scab spore levels (PMTV).

### **3) Plant fields strategically to reduce risk and spread of PMTV and TRV.**

- DO NOT plant seed potatoes in infested fields.
- Avoid planting ware potatoes (i.e. potatoes destined for consumption) in infested fields.
- DO NOT plant ware potatoes or any other crop in *highly* infested fields.
- Be aware that planting any crop in PMTV and TRV infested fields will increase your risk of spreading the pathogen on your farm. If you must grow crops in infested fields, be sure to practice a *strict* on-farm sanitation protocol.

#### 4) Use resistant cultivars strategically to reduce loss

- Understand the types of resistance to PVY. Avoid planting tolerant cultivars that serve as sources of PVY in close proximity to susceptible cultivars. Plant immune cultivars whenever possible.<sup>7</sup>
- Grow cultivars insensitive to PMTV-induced tuber necrosis and resistant to powdery scab in infested fields.<sup>8</sup>
- Grow cultivars resistant to TRV in stubby root nematode infested fields.<sup>9</sup>
- As noted in #3, be aware that planting any crop in PMTV and TRV infested fields will increase your risk on spreading the pathogen on your farm. If you must grow crops in infested fields, be sure to practice a *strict* on-farm sanitation protocol.

#### 5) Reduce spread of PVY by aphids

- Isolate seed potato fields from commercial production. Commercial fields are often a source of PVY as management of the virus is not cost-effective.
- Do not plant seed potato fields near fields of other Solanaceous crops such as tomato, eggplants, pepper, tomatillo, tobacco, ground cherry and petunia. These crops can be a source of PVY as management is not cost-effective.
- Use border non-host crops to surround small, high-value seed lots. Border crops serve to “cleanse” the aphid mouthparts of PVY before the aphid moves to the potatoes.
- Time planting and top kill to avoid aphid flights.
- Spraying for potato-colonizing PVY aphid vector populations<sup>10</sup> may reduce the spread of PVY within the field under some circumstances. Spray only when scouting indicates aphid populations are above threshold levels. See the website for a list and photos of PVY aphid vectors.<sup>10</sup>
- Spraying for immigrating winged PVY aphid vectors<sup>10</sup> (colonizing or non-colonizing) is NOT effective in controlling the spread of PVY into a field because the aphid can transmit the virus *before* it is killed by the insecticide. See the website for a list and photos of PVY aphid vectors.<sup>10</sup>
- Anti-feedant compounds may help control spread of PVY by colonizing aphids. However, they are not effective against immigrating aphids because they don’t work quickly enough.
- Mineral oils may reduce the spread of PVY by interfering with the aphid’s probing behavior and ability to puncture the leaf surface but do not protect the underside of the leaf and need to be sprayed often.

<sup>1</sup> Additional details can be found at <https://blogs.cornell.edu/potatovirus/>

<sup>2</sup> Management strategies that can be utilized by certification for PMTV and TRV are currently under development. Once developed, state agencies will need to adopt them.

<sup>3</sup> PHT and lab tests provide an estimate which has a standard deviation (+/-), e.g. a 400 tuber sample allows for the estimation of 1% virus prevalence with a standard deviation of 0.5%, which means that 95% of the time the actual level of virus will fall within the range from 0%-2%. For more information see <https://blogs.cornell.edu/potatovirus/sampling-for-tuber-testing/>

<sup>4</sup> For more information on sanitation procedures please see “Cleaning and Disinfection Potato Equipment and Storage Facilities” by Olsen and Nolte, University of ID at <https://www.cals.uidaho.edu/edcomm/pdf/CIS/CIS1180.pdf>

<sup>5</sup> For a more extensive list of TRV hosts see <https://blogs.cornell.edu/potatovirus/trv/tobacco-rattle-management/>

<sup>6</sup> A list of diagnostic labs can be found at <https://blogs.cornell.edu/potatovirus/more-info/diagnostics/>

<sup>7</sup> A list of PVY resistant, tolerant and immune cultivars can be found at the bottom of this page <https://blogs.cornell.edu/potatovirus/pvy/potato-virus-y-pvy-management/>

<sup>8</sup> A list of PMTV insensitive and powdery scab resistant cultivars can be found at the bottom of this page <https://blogs.cornell.edu/potatovirus/pmtv/potato-mop-top-management/>

<sup>9</sup> A list of TRV insensitive cultivars can be found at the bottom of this page <https://blogs.cornell.edu/potatovirus/trv/tobacco-rattle-management/>

<sup>10</sup> A list and photos of PVY aphid vectors can be found in this page <https://blogs.cornell.edu/potatovirus/galleries/virus-vectors/>

**Funding:** USDA-NIFA Award [2014-51181-22373](https://www.usda.gov/ars/programs/2014-51181-22373)



United States  
Department of  
Agriculture

National Institute  
of Food and  
Agriculture

### Project Collaborators:

Cornell University  
Colorado State University  
University of Idaho  
University of Maine  
University of Michigan  
Montana State University  
North Dakota State University  
Oregon State University  
Washington State University  
University of Wisconsin-Madison



Cornell University



Agricultural  
Research  
Service



Colorado State University



University of Idaho



Oregon State  
University

WASHINGTON STATE  
UNIVERSITY



WISCONSIN  
UNIVERSITY OF WISCONSIN-MADISON