

Managing Potato Virus Y (PVY) in Potatoes

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Potato Virus Y (PVY) is a pathogenic virus of potatoes. Arguably, it is the single most important virus the potato industry (worldwide) deals with. PVY effects not only crop yields, but tuber quality as well. PVY can be spread and disseminated by infected seed, aphid vectoring, and by mechanical means (sap-sap transmission). Since the late 1990s, it has been recognized that the potato industry has been dealing with a number of unique PVY strains. Four strains predominate the PVY complex in North America; the ordinary strain: PVY^O; and three recombinant strains: PVY^{N:O}, PVY^{N:Wi}, and PVY^{NTN}. The proportions of occurrence for these strains are observed to differ amongst production areas of the continent, however, the common observance regardless of production area is that the recombinant strains have nearly displaced the ordinary strain over the past two decades (MacKenzie et. al., 2018a). This phenomenon is likely owed to the observance of recombinant strains being less visually symptomatic in the field, making its detection by seed certification officials or farm workers attempting to rogue infected plants increasingly more difficult.

Below is a management checklist of practices potato growers and industry can adopt to help manage PVY. PVY should be thought of as a whole-industry issue. Regardless of the market an individual grower may sell into, PVY can and often does have an impact on salability and farm revenue. Without geographic isolation, most production areas have seed acreage intermixed amongst processing and tablestock acreage which further highlights the need to adopt a whole-industry approach to the disease.

- ✓ **Purchasing Certified Seed- Initial inoculum levels are likely the greatest determinant of end-of-season virus incidence. Seed certification systems, through limited generation systems, field inspection, and post-harvest testing (through serological or molecular testing methods) help ensure seed quality. If left unchecked, without further crop management for PVY, it has been observed to increase its incidence level by 2x-3x per generation.**
- ✓ **If possible, select varieties with improved tolerance and/or resistance to PVY.**
- ✓ **Clean and disinfect tools and equipment used for cutting and planting seed with quaternary ammonium products. This should be done between seed lots, or at least once daily.**
- ✓ **Use a systemic insecticide at planting. This will aid in the control of Potato-colonizing aphids and their ability to spread PVY. This will NOT FULLY prevent PVY spread however. PVY is a non-persistent virus that is readily taken up by aphids and**

disseminated to other potato plants. Therefore, a significant portion of spread is owed to non-colonizing aphids (transients) that repeatedly probe the potato crop to see if it is a suitable host. They probe for only seconds at a time, making systemic insecticides ineffective for their control, but long enough to for the uptake and spread of the PVY virus.

- ✓ **Initiate crop oil sprays early (50% Emergence) in the growing season. The exact mechanism by which oils work is unknown. They may interfere with aphid ability or suitability to land on a leaf, or wipe stylets (mouth) clean of virus particles as they probe a leaf. Studies have shown a decrease of PVY spread by 43% using oils (MacKenzie et. al., 2017; Dupuis et.al., 2017).**
- ✓ **Add a knockdown insecticide to oil sprays. Oil has proven to be a better choice than insecticide if treated alone, but together their results have been additive, and a knockdown insecticide can provide an additional 20% reduction in PVY spread (MacKenzie et. al., 2018b) .**
- ✓ **Nurse-cropping. In the past, we often only considered the benefits of nurse cropping in terms of early-season soil erosion prevention or for increased soil water holding capacity through the growing season. However, research has shown that nurse-cropping (early-season intercropping) likely interferes with aphids' selection of suitable fields/crops to settle into and probe, or alternatively, their probing of non-potato nurse crop may cleanse their stylet of virus prior to probing of potato plants. Studies have shown a decrease in PVY spread of 34% with nurse-cropping (Dupuis et.al., 2017).**
- ✓ **Farm traffic and implement management. Given its potential of mechanical spread, PVY can be transmitted from diseased plants to healthy plants through sap-sap contact caused by wounds. In traffic rows (e.g. spray rows), recent research showed a 2x-5x increase in PVY levels as compared to adjacent non-traveled rows. Farmers should consider ways to minimize traffic through rows, especially once plants are large enough to touch. Considerations maybe larger sprayers (minimizing the number of spray rows needed), earlier cultivations or hilling, or even transitioning to one-pass hilling (MacKenzie et. al., 2018b).**
- ✓ **Roguing. We are all familiar with the practice of roguing, whereby we remove any identifiable diseased or unwanted plants. Best practices are to: conduct this practice as early as possible in the season in order to avoid mechanically damaging plants; use a clean bag and remove the whole rogued plant, as well as the two adjacent plants within-row; carry out and properly dispose of the bagged rogued plants. Rogued plants should be burned or buried as soon as possible. Recent research has reiterated**

the need for proper disposal, where plants that were left adjacent to fields, or left between rows, were observed to be infective, still carrying PVY and attractive to aphids up to 7-days post-removal (Boquel et. al., 2017).

- ✓ **Maintain adequate control tactics through end-of-season. It is often tempting at the end of a long season to relax our spray programs a bit, especially once we see our crop begin to senesce, or vine-killing is just a few days or weeks away. This is often the time though, that locally, we observe large fluctuations in aphid populations and reports of aphid-feeding holes in fields. As long as there is green material left for aphids to feed upon, the potential for infection and transmission to daughter tubers remains. Growers should consider carrying spray programs through until complete crop desiccation has occurred, meaning even after a desiccant has been applied.**

References:

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