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## Preventing Tobacco Mosaic Virus Infection

*Tobacco Mosaic Virus (TMV) outbreaks are frequently blamed on the shipment of infected plugs or cuttings into area greenhouses. While this may be accurate in some cases, there are many more instances of localized TMV outbreaks that can be linked to our employees and growing practices.*

While it now seems like a century ago, I once served as an assistant grower for a mid-sized wholesale/retail greenhouse operation in the Maryland area. We had approximately 20 full time employees on the books, but over 200 workers would pass through our operation in a given year. The vast majority of these employees were tobacco users and even though we had defined break areas and handwashing facilities we would frequently catch our best workers using tobacco products in and around our greenhouse facilities.

Tobacco Mosaic Virus is a very stable virus that can exist in its infectious state for 40 years or longer. During my tenure as assistant grower, workers would wear sweatshirts and jackets to and from the various greenhouse ranges. Because of employee turnover, sweatshirts and jackets would remain behind in the breakroom and in the greenhouse for years after an employee left our operation. Any jacket or sweatshirt left in a greenhouse or breakroom was deemed community property and was considered fair game to be worn by anyone that currently worked at the operation. Unfortunately, the innocently hanging jacket in the corner of the greenhouse that was once worn by a tobacco user could now serve as the source of TMV inoculum from a non-smoker who grabbed the coat on their way to the lower greenhouse range.

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Greenhouse workers typically carry flats up against their clothing. If TMV virus particles exist on the clothing of a worker and that clothing comes in contact with a susceptible host, transmission of the virus to the crop could take place.

Several years ago, I visited a local greenhouse operation to speak to their workers about TMV prevention and the best management practices that they could employ to limit its spread. This operation had very narrow walkways and the workers had no choice, but to hold the flats of petunias against their cloth aprons as they moved plants from the rear of the greenhouse to the display areas out front.

The cloth aprons on these workers bore the stains of plant sap from thousands of petunias that were being moved and all the hand washing in the world was not going to stop the spread of this virus if it was present. The workers had to be trained to hold the flats out in front of their bodies and away from their clothing to minimize wounding and virus transmission.

Subsequent visits back to this operation over the years revealed that the workers had reverted back to their old ways and were once again carrying plants up against their bodies. When a TMV outbreak occurred, it was made worse by the flat carrying practices of its workforce.

Another client recently dealt with a TMV outbreak in grafted hydroponic heirloom tomatoes. While he had spent countless hours training his employees about hand washing and responsible tobacco usage, we observed his employees using dip and chew in the greenhouse and saw workers move from the designated smoking areas on the property to the tomato house without stopping to wash their hands.



Petunia infected with TMV. Poor sanitation practices employed by the grower when pruning and deadheading increased the severity of the infection in this greenhouse. (Photo by; Thomas G. Ford, The Pennsylvania State University)



TMV symptom expression can vary from cultivar to cultivar. This petunia displays yellowing leaves with no floral symptoms, but tested positive for TMV at the Penn State Plant Disease Lab. (Photo by: Thomas G. Ford, The Pennsylvania State University)



This petunia cultivar displayed floral symptoms with no observable mottling on the leaves. Photo by: Thomas G. Ford, The Pennsylvania State University)



TMV foliar symptoms on a grafted heirloom tomato plant being grown hydroponically. Infection was widespread and could easily be linked to poor sanitation practices employed by a tobacco using crew. Photo by: Thomas G. Ford, The Pennsylvania State University



Irregular or blotchy ripening can possibly be linked to nutritional disorders, but in this case this tomato plant tested positive for TMV. The grower's use of tobacco dust as a natural insecticide may have caused this TMV outbreak. (Photo by: Thomas G. Ford, The Pennsylvania State University)

While this TMV outbreak could possibly be attributed to the grafted plant supplier, the more likely source of infection was his operation's workforce.

TMV infections can be prevented by:

- Sanitizing all tools with a 10% chlorine bleach solution. Make sure that the chlorine bleach being used is labeled for this practice.
- Discarding TMV contaminated media away from the growing area and downwind from the greenhouse range or growing area. TMV can cling to dust and organic debris. It can be transported by wind into growing areas and can infect wounded plants.
- Encouraging workers to hold flats away from their bodies when carrying them in the greenhouse. TMV laden plant sap that accumulates on clothing can infect wounded plants that brushes up against the clothing while being transported.
- Requiring handwashing before starting work in the morning and after all breaks to prevent mechanical transmission of the virus by workers.
- Prohibiting all tobacco use in and around growing plants/crops.
- Providing nitrile gloves to workers and requiring their usage when handling plants.
- Using milk to deactivate TMV. Consider having your workers dip their hands in milk before handling plants. Milk sprays can also be used to sanitize benches and floors.
- Carefully removing dry or dead leaves from the greenhouse. If these residues can be blown around in the greenhouse they can infect wounded plants. Dispose of dead plants and/or leaves carefully by placing them immediately into a plastic trash bag. Do not carry dead or dry plants through the greenhouse or you may risk spreading the TMV virus.

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