



Tobacco mosaic virus (TMV) Frequently Asked Questions:

I decided not to discard my petunia liners and am ready to transplant, what precautions should I take when transplanting?

The easiest way for TMV to spread is through contact. Touching/handling an infected plant can easily spread the virus to the next plant(s) you touch.

- a. Scout every plant in the tray prior to transplanting; if you see suspect plants, discard the entire tray
- b. Have workers wear disposable aprons that can be discarded at the end of the day
- c. Workers can either wear disposable gloves or dip their gloved or bare hands in a fresh 20% solution (wt/vol) of nonfat dry milk (the powdered stuff that comes in a box)
 - a. Change gloves or dip hands after every tray (this will help limit spread to only that tray if TMV is present)
- d. Do not dip the tray of liners in milk, as that could end up spreading other pathogens from plant-to-plant

Can I remove the petunia(s) and plant something else into the pot/basket?

TMV causes a systemic infection in petunias, which means the virus may be present in the roots, stem and leaves and can survive for months to years in infected plant debris. In field situations, root infection has been known to occur when a susceptible crop is planted into soil containing infected plant debris. However, the ability of the virus to survive in the soil in the absence of infected plant tissue is less clear. Therefore, if you remove the entire petunia plant (including roots) from the pot/basket, there is still a risk (albeit, probably a small one) that the virus could be in the soil and potentially infect a susceptible plant re-planted into the pot/basket.

However, TMV virus particles can also survive for months in the absence of plant debris on hard surfaces such as containers, hangers, stakes, etc. When removing petunias from the pot/basket, if an infected plant is handled and then the same hand touches the side of the container or the pot hanger, the virus can be moved to those surfaces. Re-touching those now-contaminated surfaces and then touching a healthy plant can potentially infect the plant. This is why it can be so difficult to eliminate this virus once introduced into a growing facility.

- If the pot/basket has (or had) a visually symptomatic plant in it, discard the pot/basket and soil (**safest option**)
- If the already-removed petunias in the pot/basket may have been infected but you're not sure, empty the soil into a clean bin, rinse the pot/basket with water to remove soil if necessary, and then dip the pot/basket and hanger into a freshly prepared solution of 10% bleach (1:10 dilution of 5.25% bleach) or 20% solution (wt/vol) nonfat dry milk, or Virkon S (1% wt/vol) for a minimum one minute. Allow to air dry.
 - Re-fill the disinfested pot/basket with new soil if replanting with a susceptible crop (**safer option**).
- Remove the entire petunia plant, and replant a susceptible crop back into same container and same soil without any disinfestation of the container or change of soil (**High risk option – not recommended**)
- If the petunias have not been removed and appear healthy: continue scouting for symptoms (generally it takes 7-12 days for symptoms to develop from time of infection)

If I decide to replant into the pot/basket, are there any crops that are not susceptible?

Historically, many viruses originally referred to as TMV strains are now recognized as belonging to separate species. As a result, it is not always clear whether a host referenced in the literature is indeed truly susceptible to the same TMV

strain(s) that infect petunia. The following table shows the results of inoculation studies published by a team of researchers in the UK in 2001. Eleven of 23 bedding plants inoculated with a petunia isolate of TMV were susceptible. Begonias were not tested in this study; only the crops listed below were inoculated.

Spence, N., et.al., 2001. European Journal of Plant Pathology 107:633-638.

Susceptible Hosts	Symptoms present	ELISA	Non-susceptible Hosts	ELISA
<i>Bacopa</i>	no	+	<i>Antirrhinum</i>	-
<i>Convolvulus</i>	no	+	<i>Bidens</i>	-
<i>Diascia</i>	necrotic lesions	++	<i>Brachycome</i>	-
<i>Felicia</i>	no	++	<i>Geranium</i>	-
<i>Fuchsia</i>	no	++	<i>Helichrysum</i>	-
<i>Lobelia</i>	no	+?	<i>Impatiens walleriana</i>	-
<i>Osteospermum</i>	no	+?	<i>Lamium</i>	-
<i>Million Bells</i> (<i>Calibrachoa</i>)	Systemic mosaic	+	<i>Lysimachia</i>	-
<i>Scaevola</i>	no	+?	<i>Marguerite</i>	-
<i>Verbena</i>	Systemic mosaic	+	<i>Mentha</i>	-
<i>Petunia</i>	Systemic mosaic	++	<i>Nepeta</i>	-

+ = positive ELISA result; ++ = strong positive; +? = questionable positive result; - = negative result

Caution: not all plants in the above trial were symptomatic after 3 weeks, even though TMV could be detected in the inoculated plant. This means that the virus may have (or could) spread to other plants in your facility and you may not know it.

Could I have spread this virus to other plants in my greenhouse?

- Yes, it is possible. The highest risk would be for crops that were transplanted the same day, by the same crew, and in the same location as the infected petunias. Keep in mind all petunias are susceptible.

Can I diagnose/detect TMV in-house?

- Yes. Agdia TMV ImmunoStrips will give a positive reaction with many tobamoviruses, including TMV.

How does TMV spread:

- TMV can be spread on contaminated tools and on the clothing and hands of workers during routine activities (when handling plants the tiny leaf hairs and outer cells can be damaged leaking sap onto tools, hands, and clothing), as well as by plant-to-plant contact.
- If a worker handles an infected plant and then touches a door handle or a hose, for example, the next worker touching those surfaces can potentially move the virus on their hands and subsequently infect other healthy plants. The same is true for watering nozzles that may come in contact with plants during irrigation.

TMV is not transmitted by thrips (although chewing insects could potentially spread the virus)

TMV virus particles can potentially be moved through water, splashing water, or mist but the virus particle must come in contact with a wounded plant cell in order to infect. The end of the hose nozzle is more likely to move the virus from plant-to-plant than the stream of water.

What precautions should I take when disposing of infected plant material?

- Ideally wear disposable gloves and coveralls over your clothing (a disposable Tyvek spray suit would be ideal) so it can be discarded after the cleanup. Avoid going into any other greenhouses after the cleanup unless clothing is changed and hands are thoroughly washed.
- Avoid moving infected material past other plants if there is the risk of plant-to-plant contact.
- Be sure to pick up any fallen debris off the floors and or benches.
- Clean benches and any greenhouse surfaces that came in contact with infected plants with Virkon S or 1 part bleach (5.25% NaOCl) added to 9 parts water (if local regulations allow). Be sure to wipe door handles and hose nozzles with one of these materials.