



Mosaic symptom of petunia leaves caused by virus infection severe (top) and mild (bottom). (Photos courtesy of Steve Nameth)

## Virus Diseases of Petunia

Thirteen viruses can threaten your petunia crop if you don't take measures to prevent them from attacking. Here's how to identify if one of them has snuck its way into your greenhouse.

**By Steve Nameth**

**P**etunia *x hybridia* Hort. is one of many members of the family Solanaceae grown primarily as an ornamental plant, and the most economically important ornamental member of this family due to its horticultural value. It is a popular bedding plant — the third most valuable after geranium and impatiens — but is becoming more popular as a colorful addition to container gardens, hanging baskets and window boxes. Most petunia varieties propagate by seed, but new species of vegetatively propagated single petunias, such as 'Supertunia' and 'Wave' petunia have been introduced as garden ornamentals. Besides the traditional single petunia, the less-popular double petunia plants provide some of the most impressive flowers of all bedding plants. As vegetative propagation becomes more popular and the industry moves further away from seed-based propagation, the likelihood of viruses and virus-induced diseases in these crops becomes more of an issue.

The purpose of this article is to bring the reader up to speed on the subject of petunia viruses and the diseases they cause in this popular ornamental crop.

### THE VIRUSES

At my most recent count, there were approximately 130 plant viruses reported to infect petunias — too many to be covered in this article. They range from alfalfa mosaic virus to wineberry latent virus. Of these 130 viruses, there are a baker's dozen that play a significant role in causing economically important losses in petunia. They are: alfalfa mosaic virus (AMV); arabis mosaic virus (ArMV); chrysanthemum stunt virus B (CVB); cucumber mosaic virus (CMV); impatiens necrotic spot virus (INSV); and select members of the potyvirus group, which includes tobacco etch virus (TEV), tobacco mosaic virus (TMV), tobacco ringspot virus (TRSV), tobacco streak virus (TSV), tomato aspermy virus (TAV), tomato mosaic virus (ToMV), tomato ringspot virus (ToRSV) and tomato spotted wilt virus (TSWV). These viruses cover a wide variety of virus families and vary greatly in their degree of disease-causing capability. Within this group of 13, there are six viruses that cause disease in petunias more frequently than any of the others. I will cover these in detail.

**TMV.** The virus most often detected in petunias in the United States is TMV. TMV is one of



**Dramm Autofog**

sponsored by:



- Automatic Aerosol Application
- Creates Billions of Micro-particles for Even Coverage
- Perfect for Control of Whiteflies

800.258.0848  
information@dramm.com  
dramm.com

the most common and most destructive plant viruses in the world. Its host range is very broad, and it infects many species within the plant family Solanaceae, of which petunia, tomato, tobacco and peppers are some of the most important. TMV is transmitted from plant to plant primarily by mechanical means, e.g. pruning, handling of plants and plant-to-plant contact. One TMV-infected petunia in a greenhouse can be the source of infection for the entire crop, and it would only take a matter of a few days for the entire crop to become infected. In my opinion, this is the worst virus to deal with in a petunia crop.

Symptoms associated with TMV infection are few and somewhat nondescript. The primary symptom is mosaic. TMV-associated mosaic can range from severe to mild, depending on the petunia variety and the strain of TMV. TMV can also cause deformation and stunting of the leaves. Severe deformation may result in the leaves becoming "rat-tailed." Rat-tailed leaves are narrow and spindly. In some cases, TMV-infected plants can have flowers that express color breaking. Color breaking of flowers is a common symptom associated with virus infection and can vary in severity. Any one or all of these symptoms can be seen on plants infected with TMV.

**INSV and TSWV.** INSV and TSWV are closely related viruses that have the potential to cause widespread damage in petunias. Like TMV, the host range of these two viruses is very broad and includes many commonly grown bedding and potted plants. Unlike TMV, INSV and TSWV are not as easily transmitted from plant to plant by mechanical means. These two viruses move from plant to plant with the help of thrips, primarily Western Flower Thrips. Thrips are very efficient vectors of INSV and TSWV, and under conditions of

high thrips populations, one infected plant can serve as an infection source for the entire greenhouse.

Symptoms associated with INSV and TSWV in a petunia can vary, depending on the petunia variety and at what stage of plant development the initial infection took place. One of the most common symptoms is necrotic ringspots and/or necrotic flecking of the leaves. However, ringspots and necrotic flecking cannot always guarantee the presence of INSV and TSWV since other petunia viruses may manifest symptoms in the same way.

**ToRSV and TRSV.** Like INSV and TSWV, tomato ringspot virus

Table 1. Results of enzyme-linked immunosorbent assay (ELISA) testing of double petunias for 12 common petunia viruses in 1997 (212<sup>a</sup>) and 1998 (332<sup>a</sup>).

Year	VIRUSES DETECTED							
	TMV	ToRSV	TRSV	TSWV	TSV	PV	Mixed Infection <sup>b</sup>	Negative <sup>c</sup>
1997	0	12	0	5	1	0	0	194
1998	3	0	1 <sup>b</sup>	0	0	2	14	312

<sup>a</sup> total samples tested that year  
<sup>b</sup> 13 samples as a mixed infection of TMV and PV, one sample as a mixed infection of TMV and TRSV  
<sup>c</sup> negative for all viruses tested

and tobacco ringspot virus are closely related and cause the infected plant to express similar symptoms. One of the most common symptoms is ringspots. ToRSV and TRSV can also cause severe leaf deformation and necrosis. If plants are infected at an early stage of development, the end

result may be death of the entire plant. Without the aid of a laboratory analysis, it is virtually impossible to distinguish ToRSV from TRSV based solely on symptoms. These two viruses are not insect-vectored and do not present nearly the destructive potential that INSV and TSWV possess. They are not detected as commonly as the other viruses that we have discussed so far, yet are worthy of mentioning due to the destructive nature of the symptoms they manifest in the host plant.

**CMV.** Cucumber mosaic virus is the most common plant virus in the world. Though it is rarely found in petunias, it is important to mention due to the extensive nature of this virus' host range. Probably 75 percent of the bedding plants, potted plants, herbaceous perennials and vegetables grown in today's modern greenhouse are susceptible to CMV. It is vectored by many common greenhouse aphids such as the green peach aphid and melon aphid. In most cases, the virus induces a mild mosaic on leaves and color breaking on the flowers.

**ToMV.** This virus is a close relative of TMV and causes similar types of symptoms. The virus is mechanically transmitted like TMV, only not as easily. Like TMV, there are a variety of tomato mosaic virus strains, and symptoms can vary depending on the petunia variety and the virus strain.

**The Others.** The viruses that we have just covered are the most commonly found and/or have the potential to be the most



Top: Severe stunting of petunia leaves caused by TMV; Bottom: "Rat-tailing" on TMV-infected petunia.



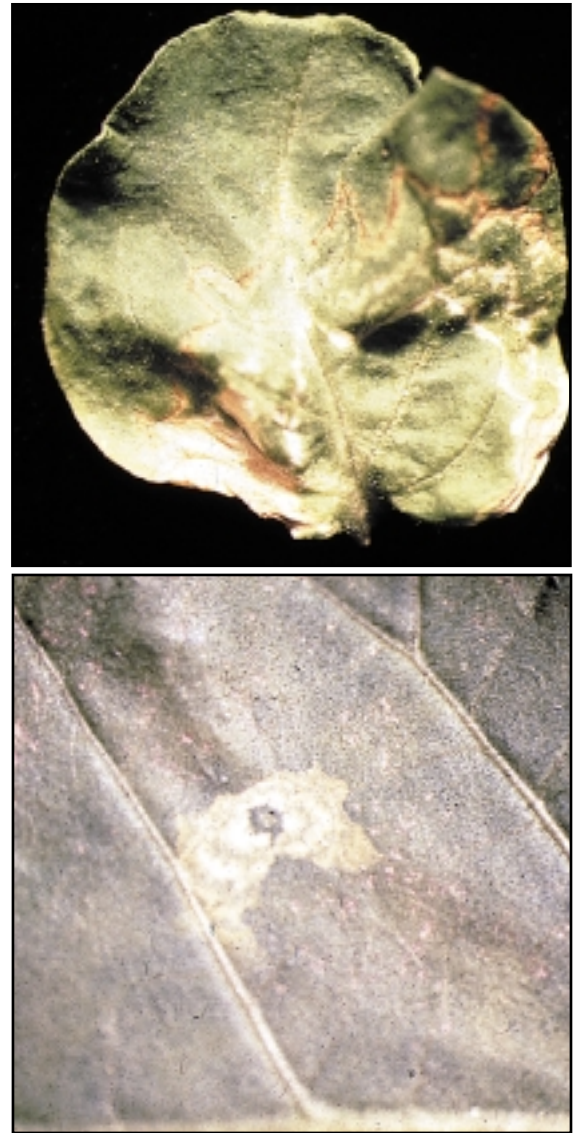
Flower color-breaking and deformation in single (top) and double (middle) petunias infected with virus. Note leaf mosaic on single petunia (bottom).

destructive. The other seven viruses can be destructive, but they are usually found in low frequencies in individual greenhouses where some unique situation has initiated infection. A recent, 2-year study at The Ohio State University of 544 double petunia plants randomly selected from greenhouses throughout Ohio indicated that TMV, ToRSV, TRSV, TSWV and TSV were the viruses responsible for virus-induced diseases in 1997 and 1998 (See Table 1, page 25). The results of this 2-year study indicate that the viruses identified vary as to type and frequency from year to year. TSV (a rare virus to find in a relatively small survey) was the only virus detected that we have not previously discussed in this article.

The other interesting fact associated with this study is the frequency of mixed infections. Plant viruses can frequently be found infecting plants in combination with other viruses. In this study, a new petunia virus was identified that appeared to be closely related to TMV and ToMV; however, its DNA sequence indicated it was a distinct virus. This virus was designated as petunia virus (PV). In 1998 PV was found in 13 samples mixed with TMV (see Table 1, page 25). Based on the variation observed in this study, it is likely if a study were conducted this year, results would vary from what we saw four years ago.

#### CONTROL OF PETUNIA VIRUSES

As with all plant viruses, the best method of control is prevention. Remember that there is



Top: Leaf necrosis and stunting caused by INSV or TSWV or one of the ringspot viruses; Bottom: Ringspot symptom on petunia leaf caused by ToRSV or TRSV.



## PERENNIALS

Finest Quality  
Perennials,  
Ground Covers,  
Herbs, Wildflowers,  
Grasses, Ferns,  
1800 Varieties, Liners  
or Finished Products

### BLUEBIRD NURSERY, INC.

P.O. Box 460  
Clarkson, NE 68629  
800-356-9164  
FAX 402-892-3738


no such thing as a systemic virus-cide. Once a plant is infected, it is infected until the plant dies. Plants that are infected with any of these viruses should never be used as a source of material for vegetative propagation unless

the individual plant has been subjected to heat therapy and meristem tip culture. Even this can be risky for some of the more stable viruses such as TMV and ToMV. In all circumstances, only plants that have been verified by

the producer to be "virus-free" should enter the greenhouse and only when these virus-free plants have been quarantined from the rest of the crop for a period of time that would allow them to manifest virus symptoms and/or

insect infestations. Suspect plants should be removed from the greenhouse and tested for a panel of common petunia viruses by a university or private lab. For INSV and TSWV, thrips control is essential. Using yellow or blue sticky cards to monitor for thrips and other insects while plants are still in quarantine can head-off disaster. Once plants have been moved out of the quarantine area, insect populations should be continually monitored.

Using seed to propagate petunias has always been a good way to eliminate a virus problem in the greenhouse; however, seed propagation is becoming less and less a method of petunia propagation with more and more vegetative propagation taking place. Also, viruses such as CMV, ToRSV and TRSV can be seed-transmitted. Thus it is essential that the seed you purchase be designated by the producer as "virus-free."

As more and more vegetative propagation takes place, and more and more new varieties are entering the market each year, more and more virus problems will become evident. There will be more viruses identified, and in some cases, novel viruses will be discovered. One such virus is the PV we discovered in our research. Because of this, new and more sensitive methods of virus identification will need to be developed. These methods can be applied to vegetative- and seed-based propagation material to help ensure a virus-free petunia crop. 

*Steve Nameth is associate professor and associate chair in the Department of Plant Pathology at The Ohio State University, Wooster, Ohio. He may be reached by phone at (614) 292-8038 or E-mail at [Nameth.2@osu.edu](mailto:Nameth.2@osu.edu).*



### LearnMore!

For more information related to this article, go to [www.onhort.com/LM.CFM/gp050203](http://www.onhort.com/LM.CFM/gp050203)