



Jean Williams-Woodward
jwoodwar@uga.edu

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TSWV and INSV on annual bedding plants

I have been seeing more Tomato Spotted Wilt Virus (TSWV) and Impatiens Necrotic Spot Virus (INSV) on annual flowering bedding plants over the past few years.

When scouting for plant diseases, you have to look for things that don't look normal. It could be obvious like wilting or dead plants, or it could be bunchy plant growth, lighter or off-colored plants, leaf spotting, etc. Early symptoms of virus diseases can easily be overlooked because viruses often don't affect all the foliage of individual or groups of plants. Often, symptoms may only be seen on a few lower leaves on one or two plants until the virus spreads within a block and symptoms become more obvious (Figure 2).



Figure 1. Light-colored ringspots on Zinnia leaves due to TSWV infection. (Image by J. Williams-Woodward)

While visiting a greenhouse, plants within a block of zinnias had leaves showing concentric light-colored ring (target-like) spots (Figure 1). Ringspots are a symptom that is characteristic of virus infection. Many viruses can cause ringspot symptoms; therefore, viruses cannot be diagnosed on symptom pattern alone. However, my first guess is usually TSWV or INSV when I see ringspots on flowering plants. Both TSWV and INSV are orthotospoviruses (formerly tospovirus) and are vectored by western flower thrips, and they can infect hundreds of plant species including agronomic and horticultural crops.

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Figure 2. Light-colored ringspots due to TSWV infection on zinnia might be overlooked if briefly scanning a block of plants. Infection is not on all plants, but is infecting more than is obvious. Only one leaf on a plant may show symptoms. (Image by J. Williams-Woodward)

The problem with identifying TSWV or INSV infection (or any other virus) based upon symptoms is that the viruses may produce different symptoms on different hosts. INSV, for example, can cause oily-looking, necrotic lesions and ringspots on impatiens (Figure 3), darkly-colored rings on coleus (Figure 4), yellow mosaic pattern or necrotic leaf veins on begonia. TSWV can cause concentric ringspots with leaf discoloration (Figure 5), purplish stem lesions, and necrosis as seen in annual vinca. Often growers don't know the extent of the virus spread because they may not recognize the varied symptoms on different hosts.

To identify virus infection, plant samples can be submitted to state, university or private diagnostic laboratories. The private pathogen testing and product development company, Agdia® (<https://www.agdia.com/>), sells easy-to-use ImmunoStrip® tests kits that are



Figure 3. Darkly-colored ringspots with a necrotic lesion in the center due to INSV infection on impatiens. (Image by J. Williams-Woodward)



Figure 4. Darkly-colored circular ring spots and speckling due to INSV infection on coleus. (Image by J. Williams-Woodward)

virus-specific and work similarly to home COVID tests (Figure 6). The tests can be done in-house and allow for quick detection of a virus, as well as some other pathogens, including *Phytophthora* and the bacterium, *Xanthomonas*. Each test will only detect a single virus or pathogen. Therefore, in-house testing would be a benefit to growers who have had a recurring issue with a particular or several viruses that it warrants having the test kits on hand. Since it was suspected that the ringspots on zinnia were caused by either TSWV or INSV, a symptomatic leaf sample was tested using a test for each virus. In this case, the zinnia tested positive for TSWV (Figure 6).

Management of virus diseases relies on accurate identification as different viruses may have different vectors and means of spread. There is no cure for virus-infected plants. Infected plants should be discarded as soon as possible to reduce the spread of the virus to other hosts. Since the virus identified on the zinnia was TSWV, thrips management and eliminating weeds from in and around greenhouses and nursery pads that may harbor thrips can help reduce virus spread. In addition, testing of incoming plant plugs or liners for virus infection and separation of plant material by source to reduce cross-contamination can help reduce virus introduction and crop losses.

**** Please Note:** The mention of specific products does not constitute an endorsement or recommendation of, nor the discrimination against similar products not mentioned.



Figure 5. Reddish-brown to purplish discolored areas on an Echeveria leaf showing faint concentric rings due to TSWV infection. (Image by J. Williams-Woodward)

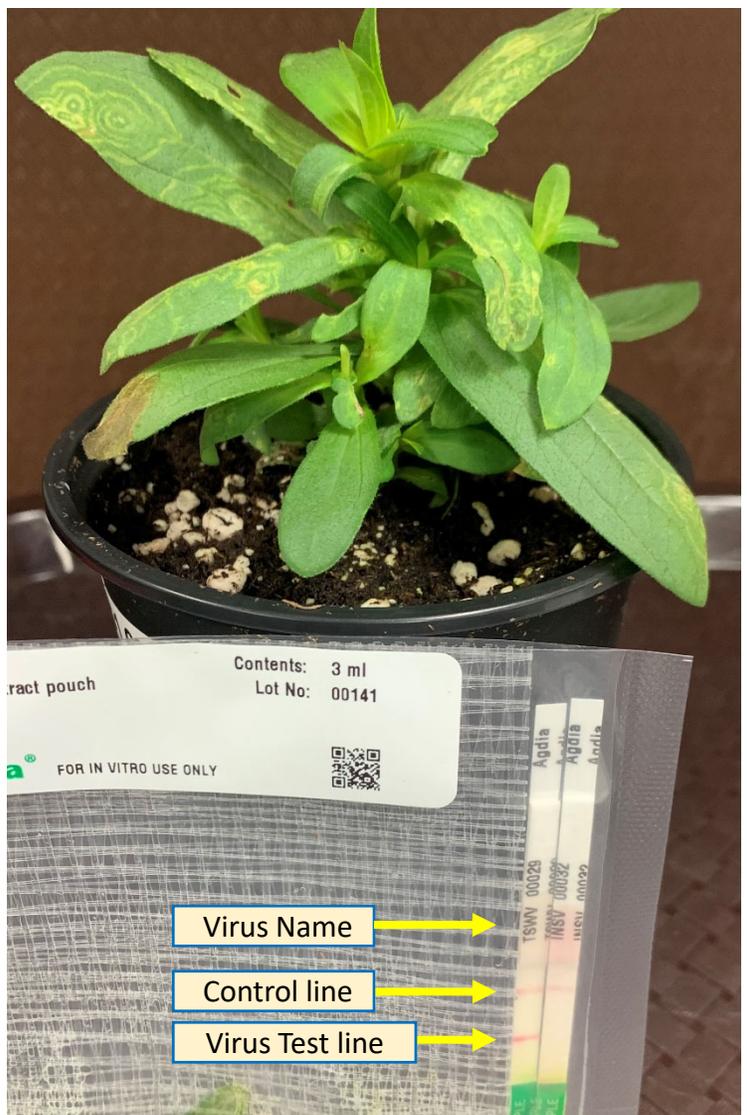


Figure 6. A leaf sample showing light-colored ringspot symptoms suspected to be due to a virus was tested using Agdia® ImmunoStrip® tests for TSWV and INSV. The sample tested positive for TSWV (two red lines on strip) and negative for INSV (only one line on strip). Symptoms were due to TSWV. (Image by J. Williams-Woodward)

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CONTRIBUTORS

Dr. Nora Catlin
Floriculture Specialist
Cornell Cooperative Extension
Suffolk County
nora.catlin@cornell.edu

Dr. Chris Currey
Assistant Professor of Floriculture
Iowa State University
ccurrey@iastate.edu

Dr. Ryan Dickson
Greenhouse Horticulture and
Controlled-Environment Agriculture
University of Arkansas
ryand@uark.edu

Thomas Ford
Commercial Horticulture Educator
Penn State Extension
tgf2@psu.edu

Dan Gilrein
Entomology Specialist
Cornell Cooperative Extension
Suffolk County
dog1@cornell.edu

Dr. Chieri Kubota
Controlled Environments Agriculture
The Ohio State University
kubota.10@osu.edu

Heidi Lindberg
Floriculture Extension Educator
Michigan State University
wolleage@anr.msu.edu

Dr. Roberto Lopez
Floriculture Extension & Research
Michigan State University
rglopez@msu.edu

Dr. Neil Mattson
Greenhouse Research & Extension
Cornell University
neil.mattson@cornell.edu

Dr. W. Garrett Owen
Sustainable Greenhouse & Nursery
Systems Extension & Research
The Ohio State University
owen.367@osu.edu

Dr. Rosa E. Raudales
Greenhouse Extension Specialist
University of Connecticut
rosa.raudales@uconn.edu

Dr. Alicia Rihn
Agricultural & Resource Economics
University of Tennessee-Knoxville
arihn@utk.edu

Dr. Debalina Saha
Horticulture Weed Science
Michigan State University
sahadeb2@msu.edu

Dr. Beth Scheckelhoff
Extension Educator - Greenhouse Systems
The Ohio State University
scheckelhoff.11@osu.edu

Dr. Ariana Torres-Bravo
Horticulture/ Ag. Economics
Purdue University
torres2@purdue.edu

Dr. Brian Whipker
Floriculture Extension & Research
NC State University
bwhipker@ncsu.edu

Dr. Jean Williams-Woodward
Ornamental Extension Plant Pathologist
University of Georgia
jwoodwar@uga.edu

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