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Annual Aster: Tomato Spotted Wilt Virus (TSWV)

Annual asters (Callistephus chinesis) with stunting, dark green mottling, leaf bronzing, and necrotic concentric rings were observed. This Alert describes and provides photos of symptoms caused by tomato spotted wilt virus (TSWV) on annual asters. To diagnose TSWV, use test strips or submit plant samples to your preferred diagnostic lab.

On a recent greenhouse visit, multiple crops of annual or China asters (*Callistephus chinesis*), at different stages of growth, were inspected. Plants within each crop had stunted growth (Fig. 1 and 2). Upon closer inspection, dark green mottling (Fig. 3), leaf bronzing (Fig. 4), and necrotic (dead leaf tissue) concentric rings (Figs. 5 and 6) were observed. Symptom severity varied across crops and individual plants. Plants with the symptoms described and shown in images (Figs. 1-6) were submitted to [Michigan State University's Diagnostic Services Lab](#) for testing. Plants were tested with an enzyme-linked immunosorbent assay (ELISA) test for four viruses found in



Figure 1. Crop of annual asters (*Callistephus chinesis*) with stunted growth. Photo by W. Garrett Owen.

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in greenhouse crops. The plants tested positive for tomato spotted wilt virus (TSWV).

Tomato Spotted Wilt Virus (TSWV)

Tomato spotted wilt virus is not new to the greenhouse ornamental world. We've long known that this virus affects a range of hosts spanning from many annual bedding plants, and herbaceous perennials, to many vegetable crops. Most greenhouse growers have seen symptoms of TSWV first hand; whether or not they realized the cause. Growers can limit losses from this disease by first educating themselves; take a few minutes to reread the many previous e-GRO Alerts that have earlier discussed this disease and provided images of TSWV symptoms on [calla lily](#) (*Zantedeschia* spp.), [cineraria](#) (*Pericallis* × *hybrida*), [lobelia](#) (*Lobelia erinus*), [Montauk daisy](#) (*Nipponanthemum nipponicum*), [New Guinea impatiens](#) (*Impatiens hawkeri*), [osteospermum](#) (*Osteospermum fruticosum*), [stephanotis](#) (*Stephanotis floribunda*), [stevia](#) (*Stevia rebaudiana*), and [vinca](#) (*Catharanthus roseus*).

The images (Figs. 1-6), in this article, show symptoms caused by TSWV on annual asters. Note that the severity of symptoms caused by TSWV are influenced by several factors including the age of the plant at the time of infection, and the host plant's sensitivity. Plants that are infected at a young age tend to develop more severe symptoms than those infected at maturity. As already noted, this virus has a wide host range, however symptoms vary in severity across hosts. Observations made during the recent greenhouse visit indicate that annual aster can be severely affected by TSWV. Plant death has been observed (Fig. 7).

It is important to note that there is a



Figure 2. Cell pack annual asters (*Callistephus chinensis*) with stunted growth. Photo by W. Garrett Owen.



Figure 3. Dark green mottling of stunted annual asters (*Callistephus chinensis*) tested positive for tomato spotted wilt virus (TSWV). Photos by W. Garrett Owen.



Figure 4. Leaf bronzing in annual asters (*Callistephus chinensis*) tested positive for tomato spotted wilt virus (TSWV). Photos by W. Garrett Owen.



Figure 5. Varying magnitude of lower leaf bronzing with necrotic (dead leaf tissue) concentric rings in annual asters (*Callistephus chinensis*) tested positive for tomato spotted wilt virus (TSWV). Photos by W. Garrett Owen.



Figure 6. Backlit leaves with varying magnitude of lower leaf bronzing with necrotic (dead leaf tissue) concentric rings in annual asters (*Callistephus chinensis*) tested positive for tomato spotted wilt virus (TSWV). Photos by W. Garrett Owen.

delay between the time when a plant is infected and when symptoms are noticeable. During this time they can serve as a source from which the virus can be further spread. The amount of time it takes for infected plants to become symptomatic can vary and is also impacted by the host, the age of plant at infection, and the growing conditions. In some instances, plants may remain symptomless (Daughtrey et al., 1995). To accurately determine if plants are infected with TSWV or INSV, one should submit a plant sample to their preferred diagnostic lab and quarantine the plant material until test results are available. One may choose to use in-house test kits to screen plant material.

Vector

Tomato spotted wilt virus is vectored by certain species of thrips including: western flower thrips (*Frankliniella occidentalis*), tobacco thrips (*F. fusca*), common blossom thrips (*F. schultzei*), Eurasian flower thrips (*F. intonsa*), onion thrips (*Thrips tabaci*), chilli thrips (*Scirtothrips dorsalis*), melon thrips (*T. palmi*), and Japanese flower thrips (*T. setosis*) (Riley et al. 2011). TSWV is not transmitted from mother thrips to their eggs

(Wijkamp et al. 1996a). Thrips only become competent vectors by feeding on infected plants during their early larval stages. After a brief latency period, the virus can be then transmitted to other plants by the same feeding action. Five minutes of feeding is all that is necessary for a larval thrips to acquire the virus and an adult thrips to transmit it to a healthy plant (Wijkamp et al. 1996b).

Management

Disease control requires that growers both remove all infected plants and control thrips. Once a plant is infected with TSWV there are no treatment options; symptomatic plants must be removed and discarded. This will help prevent the virus from spreading further. Growers should inspect all plant material especially incoming plant material from outside the greenhouse for virus symptoms or thrips.

Routine scouting and monitoring for thrips is necessary to determine infestations, thresholds, and to determine when one should begin implementing a pest management control program. See [e-GRO Alert 4.18](#) and Michigan State University Extension [2018 Greenhouse Pest Management Recommendations](#) for management and control options. For more information and an identification guide to insect and mite pests of floriculture crops, download the iBook [here](#) (Note: This book can only be viewed using iBooks 2 on an iPad. iOS 5 is required.)

Growers should also control weeds in or around the greenhouse as they may harbor thrips and TSWV, as well as other viruses. Inspection of over-wintered perennials prior to or weeks after forcing begins is recommended as this plant material may also harbor viruses.

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Figure 7. Death of annual asters (*Callistephus chinensis*) eventually occurs with tomato spotted wilt virus (TSWV), plants are also susceptible to other pathogens, such as *Botrytis*. Photo by Brian Whipker.

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