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## Perennial Lupine: Tomato Spotted Wilt Virus (TSWV)

*Perennial lupine (Lupinus polyphyllus) with stunting, dark green mottling, and necrotic concentric rings were observed. This Alert describes and provides photos of symptoms caused by tomato spotted wilt virus (TSWV) on perennial lupine. To diagnose TSWV, use a diagnostic test or submit plant samples to your preferred diagnostic lab.*

A crop of perennial lupine (*Lupinus polyphyllus*) had stunted growth (Fig. 1), distorted leaves (Figs. 2A and B), dark (Fig. 3) and light green mottling (Figs. 4A and B), and necrotic (dead leaf tissue) concentric rings (Figs. 5A and B). Symptom severity varied across the crop and individual plants. Plants with the symptoms described and shown in photos (Figs. 1-5) were submitted to [Michigan State University's Diagnostic Services Lab](#) for testing. Plants were tested with enzyme-linked immunosorbent assay (ELISA) tests for four viruses found 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



Figure 1. Example of perennial lupine (*Lupinus polyphyllus*) with stunted growth and disease symptoms. Photo by W. Garrett Owen.

Alerts that have discussed this disease and provided images of TSWV symptoms on [annual aster](#) (*Callistephus chinensis*), [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. 1-5), in this Alert, show symptoms caused by TSWV on perennial lupine. 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 greenhouse visit indicate that perennial lupine can be severely affected by TSWV.

It is important to note that there is a delay between the time when a plant is infected and when symptoms are noticeable. During this time infected plants 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 impatiens necrotic spot virus (INSV), one should submit a plant sample to their preferred diagnostic lab and quarantine the plant material until test results are



Figure 2A. Perennial lupine (*Lupinus polyphyllus*) exhibiting stunted growth and distorted, recently matured leaves. Photo by W. Garrett Owen.



Figure 2B. Perennial lupine (*Lupinus polyphyllus*) exhibiting distorted growth of recently matured leaves. Photo by W. Garrett Owen.



Figure 3. Dark green mottling of a stunted perennial lupine (*Lupinus polyphyllus*) that tested positive for tomato spotted wilt virus (TSWV). Photos by W. Garrett Owen.





Figures 4A-B. Magnitude of light green mottling of a stunted perennial lupine (*Lupinus polyphyllus*) that tested positive for tomato spotted wilt virus (TSWV). Photos by W. Garrett Owen.



Figures 5A-B. Varying magnitude of concentric rings in a perennial lupine (*Lupinus polyphyllus*) that tested positive for tomato spotted wilt virus (TSWV). Photos by W. Garrett Owen.

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). Tomato spotted wilt virus 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. A mere five minutes of feeding may be all that is necessary for a larval thrips to acquire the virus or 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 allows one to detect infestations, establish thresholds, and determine whether a corrective action is necessary. See [e-GRO Alert 4.18](#) and Michigan State University Extension [2019 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 is recommended as this plant material may also harbor viruses.

## Literature Cited

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