

Hosta Virus X

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History

Hostas are one of the most popular herbaceous ornamentals sold in the United States. Certain hosta cultivars are susceptible to a number of pests and pathogens, including several well-known viruses. Hostas are occasionally found to be infected with one of the following viruses that more typically infect ornamental hosts: *Impatiens necrotic spot virus* (INSV), *Tomato spotted wilt virus* (TSWV), *Arabidopsis mosaic virus* (ArMV), *Tobacco ringspot virus* (TRSV), *Tomato ringspot virus* (ToRSV), and *Tobacco rattle virus* (TRV). These viruses are characterized by wide host ranges and a biological vector (insect or nematode). In contrast, a more recently discovered virus infecting hostas, *Hosta virus X* (HVX), infects only hostas and lacks a biological vector for plant-to-plant spread.

Despite its relatively recent discovery (Currier and Lockhart, 1996), HVX has had a significant impact on the

hosta industry resulting from the infection and subsequent destruction of many HVX-infected hostas. Diagnostic laboratories and nursery surveys of symptomatic plants have confirmed a number of HVX-infected hosta cultivars (Table 1). New HVX-infected hosta cultivars continue to be detected.

Symptoms

There are a wide range of phenotypes among the thousands of healthy hosta cultivars related to overall plant size, leaf shape, texture, and patterns of pigmentation. HVX causes a wide variety of symptoms including stunting, enations (puckering) (fig. 1), leaf twisting, distortion (fig. 2), ringspots (fig. 3), necrosis, and death. Changes in pigmentation (lighter or darker) can be a generalized mosaic or mottle, circular spots (fig. 4), or a symptom described as an “ink-bleed” pattern resulting



Figure 1. Enations and puckering symptoms on HVX-infected *H. 'Francee'* (photo by Dennis J. Lewandowski).



Figure 2. Leaf deformation and puckering on HVX-infected *H. 'Climax'* (photo by Dennis J. Lewandowski).



Figure 3. Necrotic ring spots on HVX-infected hosta (photo by Dennis J. Lewandowski).

Table 1. Hosta species and cultivars for which some HVX-positive plants have been confirmed (does not imply that all plants or sources of these cultivars are infected)

<i>Hosta fortunei</i> 'Albomarginata'	<i>H.</i> 'Goldrush'
<i>H. fortunei</i> 'Aureomarginata'	<i>H.</i> 'Janet'
<i>H. sieboldiana</i>	<i>H.</i> 'Krossa Regal'
<i>H. sieboldiana</i> 'Albomarginata'	<i>H.</i> 'Night Before Christmas'
<i>H. sieboldiana</i> 'Elegans'	<i>H.</i> 'Pacific Blue Edger'
<i>H. undulata</i> 'Mediovariegatum'	<i>H.</i> 'Paradise Joyce'
<i>H.</i> 'August Moon	<i>H.</i> 'Patriot'
<i>H.</i> 'Birchwood Parky's Gold'	<i>H.</i> 'Paul's Glory'
<i>H.</i> 'Blue Cadet'	<i>H.</i> 'Pilgrim'
<i>H.</i> 'Bressingham Blue'	<i>H.</i> 'Regal Splendor'
<i>H.</i> 'Chantilly Lace'	<i>H.</i> 'Royal Standard'
<i>H.</i> 'Climax'	<i>H.</i> 'So Sweet'
<i>H.</i> 'Color Glory'	<i>H.</i> 'Sugar and Cream'
<i>H.</i> 'Francee'	<i>H.</i> 'Sum & Substance'
<i>H.</i> 'Gold Edger'	<i>H.</i> 'Twilight'
<i>H.</i> 'Gold Standard'	<i>H.</i> 'Wide Brim'
<i>H.</i> 'Golden Tiara'	<i>H.</i> 'Yellow Splash Rim'

from localized changes in pigmentation along veins (fig. 5), or combinations of these. Distinguishing symptoms due to HVX from normal appearance make it difficult to discern suspect plants. Symptoms may not appear for several years, and some HVX-susceptible cultivars never exhibit symptoms (Blanchette and Lockhart, 2003). Symptoms caused by HVX are generally consistent for a given cultivar.

Descriptions and pictures of symptoms are available for some of the more common and popular cultivars.



Figure 4. Chlorotic concentric rings on *H.* 'Royal Standard' (photo by Dennis J. Lewandowski).

Unfortunately, we cannot predict how the remaining several thousand untested cultivars might respond to HVX infection. However, comparisons to known healthy specimens of the same cultivar can aid in the identification of suspect plants that merit testing to confirm infection by HVX. There is speculation that the quest to develop new and different cultivars may have contributed to the unintentional spread of HVX with cultivars with unusual leaf patterns.

Transmission

Unlike the other viruses that are known to infect hostas that are vectored by either thrips (INSV and TSWV) or nematodes (ArMV, TRSV, ToRSV, and TRV), there is no known vector for HVX. The primary route of infection of HVX is through propagation from infected plants. Secondary transmission is due to mechanical wounding of a healthy, susceptible hosta and the subsequent introduction of sap from an HVX-infected plant. This can occur through HVX-contaminated cutting tools when dividing plants, removal of senescent leaves and scapes, routine handling of infected and healthy plants, and reusing contaminated pots.

There is one report of seed transmission of HVX from one *Hosta* species (Ryu et al., 2006). Additionally, HVX



Figure 5. “Ink-bleed” symptom on *H. ‘Gold Standard’* (photo by Dennis J. Lewandowski).

has been detected in seed from another infected hosta, although it is not known if plants derived from this seed would produce infected plants. Seed transmission is a largely ignored potential route of virus dissemination, and merits further study.

Detection

The only definitive way to confirm whether a hosta is infected with HVX is with a diagnostic test specific for HVX. Previously, this service was only available through a diagnostic laboratory or certain university laboratories. Now, a simple rapid test is also available to growers, diagnosticians, and consultants, enabling the testing of a single plant in-house. This test, called an ImmunoStrip, is available from Agdia, Inc. (Elkhart, Indiana). Tissue is ground in the provided sample bag that contains sample buffer. The ImmunoStrip for performing the assay is inserted into the sap and the presence of a second band in addition to the positive control band within 30 minutes indicates a positive reaction for HVX.

Management

To minimize the incidence of HVX-infected plants, begin by purchasing material from reputable sources. Some growers have chosen to purchase certain problematic cultivars from sources that propagate tissue culture-derived, virus-free plants. There are additional costs associated with the longer time required to finish plants, but this may be offset by the savings realized from reduced losses due to HVX.

There are no chemical treatments to eliminate HVX, or any virus, from an infected plant. Train workers to recognize plants with an atypical appearance suggestive of virus infection, and in particular, the specific HVX symptoms on cultivars with a history of HVX infection. Suspect plants should be removed from production and tested if typical HVX symptoms are not known on that particular cultivar. Infected plants should be destroyed, not composted, to minimize infection of other susceptible plants. In a landscape bed, residual root tissue remains a source of virus inoculum that could infect a susceptible hosta planted in the same location until it is completely degraded by microorganisms.

Propagation and year-end clean-up should only begin after removing symptomatic plants. In a container nursery, pots from infected plants should not be reused without disinfecting with 1:10 dilution of bleach or another product labeled for this purpose. Knives used to divide hostas and tools used to remove leaves should be regularly disinfected; ideally between plants, and at a minimum between different cultivars since some cultivars are symptomless carriers and others may show delayed symptoms, yet are infected.

References

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- Ryu, K.H., Park, M.H., Lee, M.Y., and Lee, J.S. 2006. Characterization and seed transmission of *Hosta virus X* isolated from *Hosta* plants. *Acta Hort.* 722, 91–94.

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