

GALLERY OF ORNAMENTAL PLANT VIRUS SYMPTOMS

PLANT INDUSTRY BUREAU LAB

WISCONSIN DEPARTMENT OF AGRICULTURE, TRADE, AND CONSUMER PROTECTION

Introduction

Plant viruses are microscopic agents that can infect plants and cause diseases that affect the quality and viability of those plants. Some plant viruses have large host ranges while others only infect one host. Symptoms of viral infections vary greatly between viruses and even between hosts infected with the same virus. Some general symptoms of a viral infection include leaf mottling, mosaic, ringspot, necrosis, turgidity, distortion, stunting, and death. Insects, nematodes, plant sap, plant propagation, and humans can transmit viruses between plants. Once infected, there is no good way to eliminate or treat the virus without damaging the host plant. One of the best ways to manage plant viruses is to remove and destroy symptomatic plants.

We created the *Gallery of Ornamental Plant Virus Symptoms* to help nursery professionals, growers, diagnosticians, and plant enthusiasts recognize the symptoms of different viruses on common ornamental plants. The final diagnosis of a viral infection must include appropriate test methods and cannot be based on visual symptoms alone.

Viruses can be detected and identified in plant material using a variety of methods. The viruses in the *Gallery* were identified using one or more of the following methods: electron microscopy, enzyme-linked immunosorbent assay (ELISA), lateral flow device (LFD), polymerase chain reaction (PCR), reverse transcription polymerase chain reaction (RT-PCR), and sequencing.

The *Gallery* is an assembly of the viruses detected on samples submitted to the Wisconsin Department of Agriculture, Trade and Consumer Protection Plant Industry Bureau Laboratory (PIB Lab) from 2007 to 2023. All diagnostic work was completed at the PIB Lab unless otherwise indicated. This *Gallery* does not include all plant viruses or host-virus combinations, only those observed at the PIB Lab.

How to Use This Gallery

The *Gallery* is organized alphabetically by the host plant's scientific name. Each entry contains the host plant's scientific name, common name, variety (if known), virus(es) detected, laboratory methods used for identification, and images of the plant and symptoms.

One of the easiest ways to navigate this document is to use the "Find" feature. Use the keys CTRL + F to pull up the find function and search the document using keywords. At the end of this document, we have included an index to find entries by host plant scientific name, host plant common name, and virus.

Bugwood image archive: <http://www.ipmimages.org/browse/Archivethumb.cfm?Arc=8>.

Viruses and Their Abbreviations

aconitum latent virus (AcLV)	iris severe mosaic virus (ISMV)
alternanthera mosaic virus (AltMV)	kalanchoe mosaic virus (KMV)
alfalfa mosaic virus (AMV)	lilac leaf chlorosis virus (LLCV)
arabis mosaic virus (ArMV)	lily mottle virus (LMOV)
beet ringspot virus (BRSV)	lily symptomless virus (LYLSV)
bean yellow mosaic virus (BYMV)	papaya mosaic virus (PapMV)
canna yellow mottle virus (CaYMV)	potato virus S (PVS)
canna yellow streak virus (CaYSV)	Potyvirus group (potyvirus)
chili pepper mild mottle virus (CPMMoV)	shamrock chlorotic ringspot virus (SCRV)
clematis chlorotic mottle virus (CICMoV)	spiraea leafspot spherical virus (SLSSV)
clover yellow vein virus (CIYVV)	spiraea yellow leafspot virus (SYLSV)
cucumber mosaic virus (CMV)	tobacco mosaic virus (TMV)
dahlia mosaic virus (DMV)	tobacco rattle virus (TRV)
dasheen mosaic virus (DsMV)	tobacco streak virus (TSV)
figwort mosaic virus (FMV)	tomato ringspot virus (ToRSV)
hosta virus X (HVX)	tomato spotted wilt virus (TSWV)
llarvirus group (llarvirus)	turnip mosaic virus (TuMV)
impatiens necrotic spot virus (INSV)	wisteria vein mosaic virus (WVMV)

Aconitum fischeri, Monkshood, 'Azure'

Viruses Detected:

aconitum latent virus (AcLV)
cucumber mosaic virus (CMV)
undetermined potyvirus

Detection Method:

Agdia CMV and Potyvirus LFD
Electron Microscopy conducted by University of Minnesota, Plant Disease Clinic



***Aconitum fisheri*, Monkshood, 'Azure'**

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



Aconitum sp., Monkshood

Virus Detected:

Unknown – filamentous virus particles found

Detection Method:

Electron Microscopy conducted by University of Minnesota, Plant Disease Clinic



Actaea racemosa, Black Cohosh

Virus Detected:

undetermined potyvirus

Detection Method:

RT-PCR



Actinidia arguta, Hardy Kiwi, 'Issai'

Virus Detected:

impatiens necrotic spot virus (INSV)

Detection Method:

Agdia INSV LFD



***Agastache* sp., Mexican Giant Hyssop, 'Acapulco Orange'**

Virus Detected:

impatiens necrotic spot virus (INSV)

Detection Method:

Agdia INSV LFD



Ajuga sp., Bugleweed, 'Catlin's Giant'

Virus Detected:

alfalfa mosaic virus (AMV)

Detection Method:

RT-PCR



Ajuga sp., Bugleweed, 'Gaiety'

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



Alcea rosea, Hollyhock, 'Chaters Double Mix'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Alstroemeria sp., Peruvian Lily

Virus Detected:

tomato spotted wilt virus (TSWV)

Detection Method:

Agdia TSWV LFD



Anemone tomentosa, Windflower, 'Robustissima'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



***Angelonia* sp., Summer Snapdragon**

Virus Detected:

alternanthera mosaic virus (AltMV) or papaya mosaic virus (PapMV).

Detection Method:

ELISA conducted by Agdia, Inc.



Antirrhinum sp., Snapdragon

Virus Detected:

impatiens necrotic spot virus (INSV)

Detection Method:

Agdia INSV LFD



Armoracia rusticana, Horseradish

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Astilbe arendsii, False Spiraea, 'Fanal'

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



Astilbe arendsii, False Spiraea, 'Fanal'

Virus Detected:

cucumber mosaic virus (CMV)

tobacco rattle virus (TRV)

Detection Method:

Agdia CMV LFD and RT-PCR



***Astilbe arendsii*, False Spiraea**

Virus Detected:

cucumber mosaic virus (CMV)

tobacco streak virus (TSV)

Detection Method:

Agdia CMV LFD, RT-PCR, and sequencing



Astilbe chinensis, False Spiraea, 'Heart and Soul'

Virus Detected:

tobacco streak virus (TSV)

Detection Method:

RT-PCR and sequencing



Astilbe japonica, False Spiraea

Virus Detected:

undetermined ilarvirus

Detection Method:

RT-PCR



Astilbe sp., False Spiraea

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Betula nigra, River Birch

Virus Detected:

undetermined ilarvirus

Detection Method:

RT-PCR



Begonia x hiemalis, Tuberous Begonia, 'Non-Stop Rose Petticoat', 'Go-Go Rose Bicolor'

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



Top Left: CMV infected 'Non-Stop Rose Petticoat'

Top Right: Healthy 'Non-Stop Apricot'

Bottom: CMV infected 'Go-Go Rose Bicolor'

Begonia x hiemalis, Tuberous Begonia

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



***Begonia x hiemalis*, Tuberous Begonia, 'Cindy Fringed'**

Virus Detected:

impatiens necrotic spot virus (INSV)

Detection Method:

Agdia INSV LFD



***Begonia x hiemalis*, Tuberous Begonia, 'Dark Britt'**

Virus Detected:

impatiens necrotic spot virus (INSV)

Detection Method:

Agdia INSV LFD



Belamcanda chinensis, Blackberry Lily

Virus Detected:

tomato spotted wilt virus (TSWV)

Detection Method:

Agdia TSWV LFD



Bergenia sp., Pig Squeak

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



***Brugmansia insignis*, Angel's Trumpet, 'Charles Grimaldi'**

Virus Detected:

tobacco mosaic virus (TMV)

Detection Method:

Agdia TM LFD



***Buddleia davidii*, Butterfly Bush, 'Pink Delight'**

Virus Detected:

undetermined ilarvirus

Detection Method:

RT-PCR



***Calibrachoa* sp., Million Bells**

Virus Detected:

Suspected chili pepper mild mottle virus (CPMMoV)

Detection Method:

Agdia TMV LFD, CPMMoV is known to cross react with TMV LFD.



***Calibrachoa* sp., Million Bells**

Virus Detected:

Suspected chili pepper mild mottle virus (CPMMoV)

Detection Method:

Agdia TMV LFD, CPMMoV is known to cross react with TMV LFD.



Campanula sp., Bellflower

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



Canna indica, Canna Lily, 'Orange Chocolate'

Virus Detected:

canna yellow mottle virus (CaYMV)

Detection Method:

RT-PCR



***Canna sp.*, Canna Lily, 'Banana Punch'**

Virus Detected:

Canna yellow streak virus (CaYSV)

Detection Method:

RT-PCR



Canna sp., Canna Lily, 'Burning Ember'

Virus Detected:

undetermined potyvirus

Detection Method:

RT-PCR



Canna sp., Canna Lily, 'Cannova Yellow'

Virus Detected:

canna yellow mottle virus (CaYMV)

Detection Method:

RT-PCR



Canna sp., Canna Lily, 'City of Portland'

Virus Detected:

undetermined potyvirus

Detection Method:

RT-PCR



Canna sp., Canna Lily, 'Crimson Beauty'

Virus Detected:

Canna yellow streak virus (CaYSV)

Detection Method:

RT-PCR



Canna sp., Canna Lily, 'Futurity'

Virus Detected:

undetermined potyvirus

Detection Method:

RT-PCR



Canna sp., Canna Lily, 'Red King Humbert'

Virus Detected:

undetermined potyvirus

Detection Method:

RT-PCR



Canna sp., Canna Lily, 'Tropicanna'

Virus Detected:

Canna yellow streak virus (CaYSV)

Detection Method:

RT-PCR



Capsicum annuum, Pepper

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



Celtis occidentalis, Hackberry

Disease Detected:

hackberry island chlorosis

Detection Method:

Electron Microscopy conducted by University of Minnesota, Plant Disease Clinic



Chelone oblique, Turtlehead

Disease Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



***Clematis* sp., Clematis, ‘Dancing Dorian’**

Virus Detected:

clematis chlorotic mottle virus (CICMoV)

Detection Method:

RT-PCR and Electron Microscopy conducted by the University of Minnesota, Plant Disease Clinic



***Clematis* sp., Clematis, ‘Dancing Queen’**

Virus Detected:

clematis chlorotic mottle virus (CICMoV)

Detection Method:

RT-PCR and Electron Microscopy conducted by the University of Minnesota, Plant Disease Clinic



Clematis sp., Clematis, 'Dancing Smile'

Virus Detected:

clematis chlorotic mottle virus (CICMoV)

Detection Method:

RT-PCR and Electron Microscopy conducted by the University of Minnesota, Plant Disease Clinic



***Clematis* sp., Clematis, 'Guernsey Cream'**

Virus Detected:

clematis chlorotic mottle virus (CICMoV)

Detection Method:

RT-PCR and Electron Microscopy conducted by the University of Minnesota, Plant Disease Clinic



Clematis sp., Clematis, 'Multi Blue'

Virus Detected:

clematis chlorotic mottle virus (CICMoV)

Detection Method:

RT-PCR and Electron Microscopy conducted by the University of Minnesota, Plant Disease Clinic



Clematis sp., Clematis, 'Natasha'

Virus Detected:

clematis chlorotic mottle virus (CICMoV)

Detection Method:

RT-PCR and Electron Microscopy conducted by the University of Minnesota, Plant Disease Clinic



Colocasia sp., Elephant Ear

Virus Detected:

dasheen mosaic virus (DsMV)

Detection Method:

RT-PCR and sequencing



***Coreopsis verticillata*, Coreopsis, 'Zagreb'**

Virus Detected:

tomato spotted wilt virus (TSWV)

Detection Method:

Agdia TSWV LFD



Dahlia sp., Dahlia

Virus Detected:

dahlia mosaic virus (DMV)

Detection Method:

PCR



Delphinium elatum, Larkspur

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Delphinium elatum, Larkspur, 'Black Knight'

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



Delphinium elatum, Larkspur, 'Lilac Pink'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Delphinium elatum, Larkspur, 'Magic Fountain'

Virus Detected:

potato virus S (PVS)

tobacco rattle virus (TRV)

Detection Method:

RT-PCR and sequencing for PSV conducted by USDA ARS

RT-PCR



Delphinium elatum, Larkspur, 'Magic Fountain'

Virus Detected:

tobacco mosaic virus (TMV)

Detection Method:

Agdia TMV LFD



Delphinium elatum., Larkspur, 'Magic Fountain Mix'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Dianthus sp., Carnation

Virus Detected:

impatiens necrotic spot virus (INSV) (INSV)

Detection Method:

Agdia INSV LFD



Dicentra spectabilis (*Lamprocapnos spectabilis*), Bleeding Heart

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Dicentra spectabilis (*Lamprocapnos spectabilis*), Bleeding Heart

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Dicentra spectabilis (*Lamprocapnos spectabilis*), Bleeding Heart

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Dicentra spectabilis (*Lamprocapnos spectabilis*), Bleeding Heart

Virus Detected:

cucumber mosaic virus (CMV)

tobacco rattle virus (TRV)

Detection Method:

Agdia CMV LFD

RT-PCR



Digitalis x isoplexis, Tender Foxglove

Virus Detected:

tobacco mosaic virus (TMV)

Detection Method:

Agdia TMV LFD



Echinacea purpurea, Purple Coneflower, 'Magnus'

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



***Epimedium grandiflorum*, Barrenwort, 'Lilafee'**

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



***Epimedium grandiflorum*, Barrenwort, 'Purple Pixie'**

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Epimedium x rubrum, Barrenwort

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Epimedium sp., Barrenwort

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



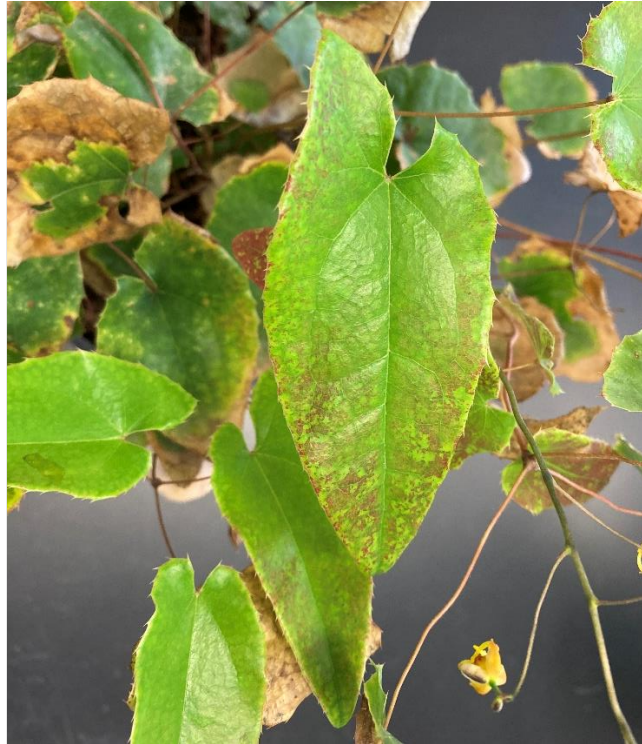
Epimedium sp., Barrenwort, 'Amber Queen'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



***Epimedium sp.*, Barrenwort, 'Lilac Fairy'**

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



***Epimedium sp.*, Barrenwort, 'Rose Queen'**

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Epimedium x versicolor, Barrenwort, 'Sulpureum'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Ficus carica, Fig, 'Black Jack'

Virus Detected:

figwort mosaic virus (FMV)

Detection Method:

Electron microscopy and RT-PCR University of Minnesota, Plant Disease Clinic



Freesia refracta, Freesia

Virus Detected:

undetermined potyvirus

Detection Method:

RT-PCR



Gladiolus sp., Gladiolus, 'Mona Lisa'

Virus Detected:

bean yellow mosaic virus (BYMV)

Detection Method:

RT-PCR and sequencing



Gladiolus sp., Gladiolus

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



Helleborus sp., Hellebore, 'Royal Heritage Mix'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Helenium autumnale, Sneezeweed, 'Tie Dye'

Virus Detected:

undetermined potyvirus

Detection Method:

Agdia Poty LFD



Helenium sp., Sneezeweed, 'Chelsey'

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



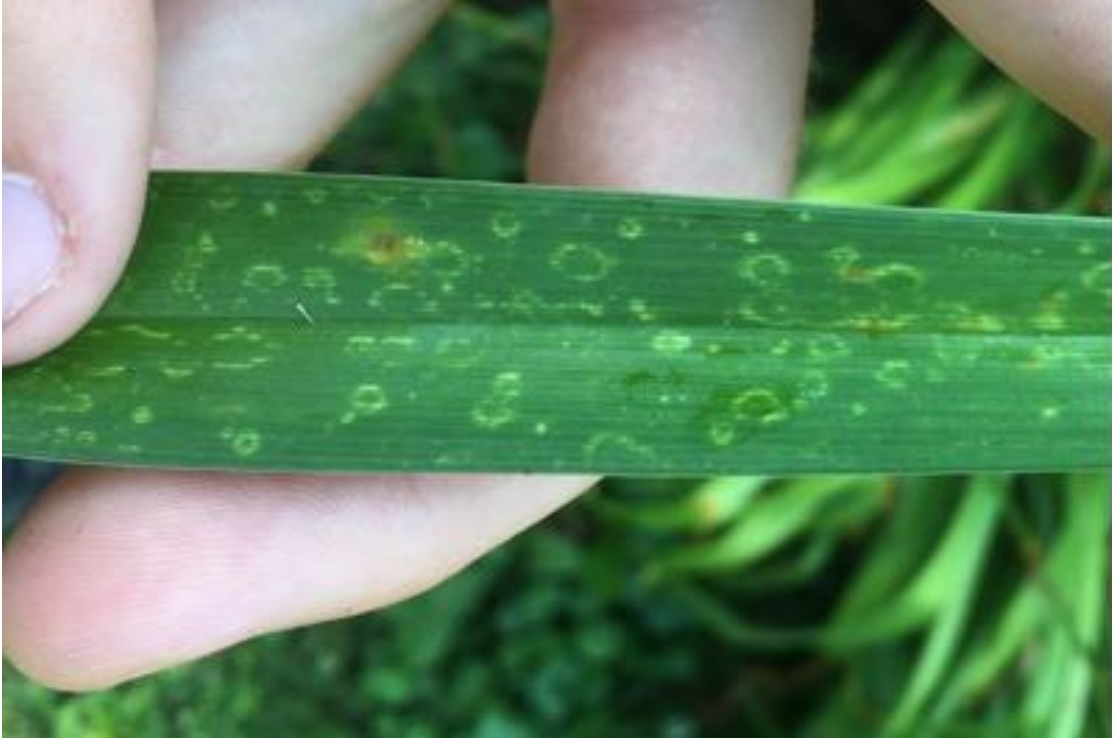
Hemerocallis sp., Day Lily

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



Heuchera sp., Coral Bells

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Heuchera sp., Coral Bells, 'Swirling Fantasy'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



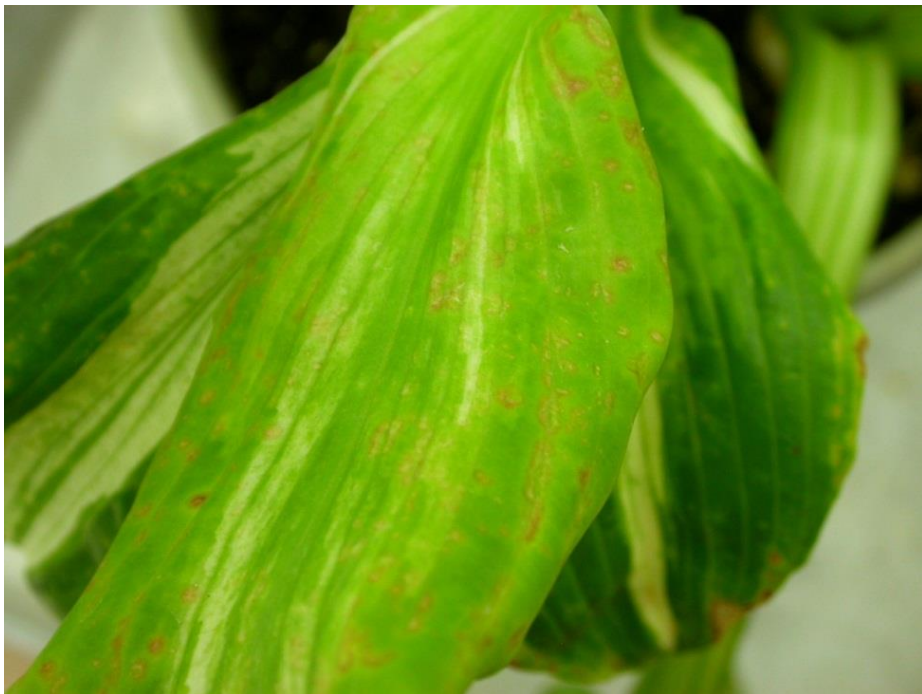
Hosta sp., Hosta, 'Albo-Marginata'

Virus Detected:

arabis mosaic virus (ArMV)

Detection Method:

Agdia ArMV LFD



Hosta sp., Hosta, 'Albo-Marginata'

Virus Detected:

hosta virus X (HVX)

Detection Method:

Agdia HVX LFD



Hosta sp., Hosta, 'Blue Angel'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Hosta sp., Hosta, 'Blue Angel'

Virus Detected:

tomato spotted wilt virus (TSWV)

Detection Method:

Agdia TSWV LFD



Hosta sp., Hosta, 'Christmas Tree'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Hosta sp., Hosta, 'Daybreak'

Virus Detected:

hosta virus X (HVX)

Detection Method:

Agdia HVX LFD



Hosta sp., Hosta, 'Honeybells'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Hosta sp., Hosta, 'Krossa Regal'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Hosta sp., Hosta, 'Magic Fire'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Hosta sp., Hosta, 'Paul's Glory'

Virus Detected:

arabis mosaic virus (ArMV)

hosta virus X (HVX)

Detection Method:

Agdia ArMV LFD and Agdia HVX LFD



Hosta sp., Hosta, 'Regal Splendor'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Hosta sp., Hosta, 'So Sweet'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Hosta sp., Hosta, 'Sum & Substance'

Virus Detected:

hosta virus X (HVX)

Detection Method:

Agdia HVX LFD



Hosta sp., Hosta, 'Undulata'

Virus Detected:

hosta virus X (HVX)

tobacco rattle virus (TRV)

Detection Method:

Agdia HVX LFD and RT-PCR



Hoya carnosa, Wax Plant

Virus Detected:

impatiens necrotic spot virus (INSV)

Detection Method:

Agdia INSV LFD



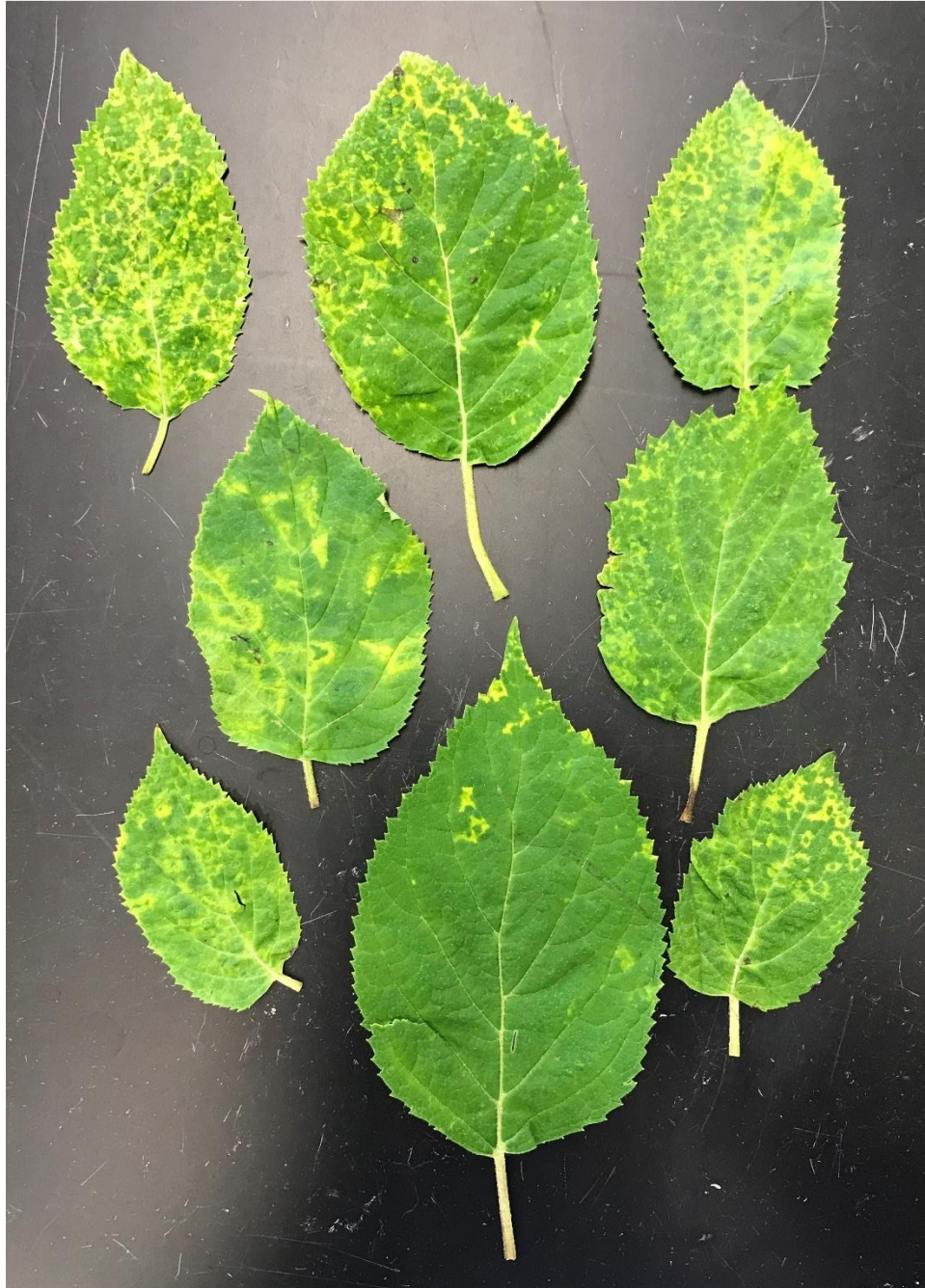
Hydrangea sp., Hydrangea, 'Incrediball'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Iris ensata, Japanese Iris, 'Mt. Fujiyama'

Virus Detected:

impatiens necrotic spot virus (INSV)

Detection Method:

Agdia INSV LFD



Iris sp., Dwarf German Iris

Virus Detected:

iris severe mosaic virus (ISMV)

Detection Method:

RT-PCR and sequencing



Iris sp., Bearded Iris, 'Avalon Sunset'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Iris versicolor, Northern Blue Flag Iris

Virus Detected:

tomato spotted wilt virus (TSWV)

Detection Method:

Agdia TSWV LFD



Lathyrus latifolius, Sweet Pea, 'Pearl Mix'

Virus Detected:

undetermined Ilarvirus

Detection Method:

RT-PCR



Ligularia sp., Leopard Plant

Virus Detected:

tomato spotted wilt virus (TSWV)

Detection Method:

Agdia TSWV LFD



Lilium sp., Oriental Lily

Virus Detected:

lily symptomless virus (LYLSV)

Detection Method:

ELISA conducted by Ohio Department of Agriculture



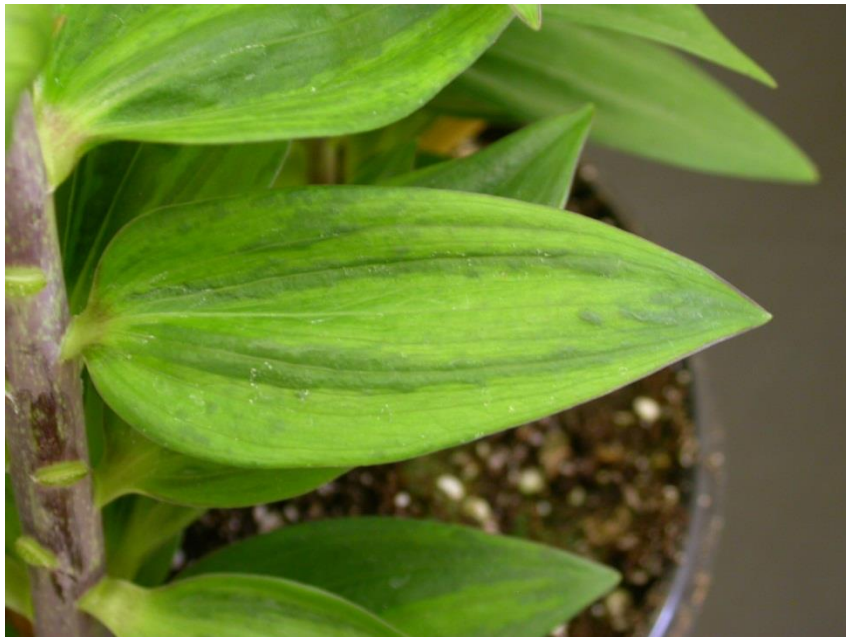
Lilium sp., Oriental Lily, 'Angelique'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Lilium sp., Lily, 'Scarlet Delight'

Virus Detected:

lily mottle virus (LMoV)

Detection Method:

RT-PCR and sequencing



Lilium sp., Oriental Lily, 'Sorbonne'

Virus Detected:

tomato ringspot virus (ToRSV)

Detection Method:

Agdia ToRSV LFD



***Lobelia sp.*, Cardinal Flower**

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



***Lobelia sp.*, Cardinal Flower**

Virus Detected:

unknown virus, spherical virus particles present

Detection Method:

Electron Microscopy conducted by the University of Minnesota, Plant Disease Clinic



***Lobelia sp.*, Cardinal Flower, 'Ruby Slippers'**

Virus Detected:

cucumber mosaic virus (CMV)

tobacco rattle virus (TRV)

turnip mosaic virus (TuMV)

Detection Method:

Agdia CMV LFD, RT-PCR, and sequencing



Lupinus sp., Lupine

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



Lupinus sp., Lupine, 'Minarette'

Virus Detected:

tomato spotted wilt virus (TSWV)

Detection Method:

Agdia TSWV LFD



***Lychnis x arkwrightii*, Maltese Cross, 'Orange Gnome'**

Virus Detected:

impatiens necrotic spot virus (INSV)

Detection Method:

Agdia INSV LFD



***Lychnis x arkwrightii*, Maltese Cross, 'Vesuvius'**

Virus Detected:

impatiens necrotic spot virus (INSV)

Detection Method:

Agdia INSV LFD



Lychnis chalconica, Maltese Cross, 'Lipstick'

Virus Detected:

tobacco mosaic virus (TMV)

Detection Method:

Agdia TMV LFD



Lysimachia sp., Creeping Jenny

Virus Detected:

tomato spotted wilt virus (TSWV)

Detection Method:

Agdia TSWV LFD



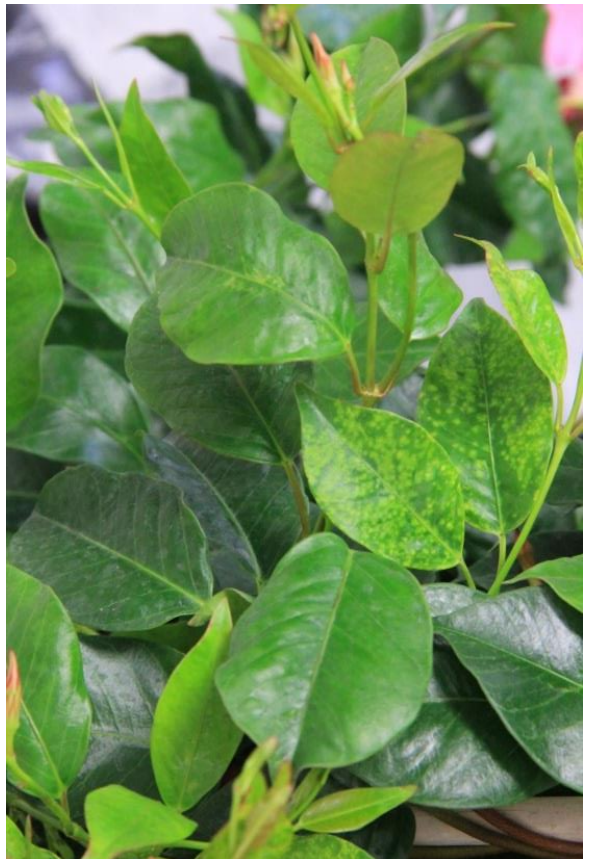
Mandevilla sp., Mandevilla

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



Mandevilla sp., Mandevilla, 'Sun Parasol'

Virus Detected:

undetermined potyvirus

Detection Method:

Agdia POTY LFD



Mertensia virginica, Virginia Bluebells

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Oxalis regnellii, Shamrock

Virus Detected:

shamrock chlorotic ringspot virus (SCRV)

beet ringspot virus (BRSV)

Detection Method:

Electron microscopy, RT-PCR, and sequencing conducted by the University of Minnesota, Plant Disease Clinic



Pachysandra terminalis, Japanese Pachysandra, 'Green Carpet'

Virus Detected:

- alfalfa mosaic virus (AMV)
- undetermined filamentous virus

Detection Method:

Electron microscopy and RT-PCR conducted by the University of Minnesota, Plant Disease Clinic



Paeonia sp., Peony

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Paeonia sp., Peony

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Paeonia suffruticosa, Peony, 'Momoyama'

Virus Detected:

unknown virus – filamentous virus particles 500-600 nanometers present

Detection Method:

Electron Microscopy conducted by the University of Minnesota, Plant Disease Clinic



Penstemon sp., Beardtongue

Virus Detected:

impatiens necrotic spot virus (INSV) (INSV)

Detection Method:

Agdia INSV LFD



Petunia hybrid, Petunia

Virus Detected:

tobacco mosaic virus (TMV)

Detection Method:

Agdia TMV LFD



Petunia hybrid, Petunia

Virus Detected:

tobacco mosaic virus (TMV)

Detection Method:

Agdia TMV LFD



Petunia hybrid, Petunia

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Phlox sp., Phlox

Virus Detected:

tobacco rattle virus (TRV)
undetermined potyvirus

Detection Method:

RT-PCR, Agdia Poty LFD



Phlox sp., Phlox, 'Cleopatra'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Phlox sp., Phlox, 'Flame Blue'

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



Phlox sp., Phlox, 'Orange-Red'

Virus Detected:

undetermined potyvirus

Detection Method:

Agdia Poty LFD



Phlox sp., Phlox, 'Peppermint Twist'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Phlox sp., Phlox, 'Pink Lady'

Virus Detected:

cucumber mosaic virus (CMV)

tobacco rattle virus (TRV)

Detection Method:

Agdia CMV LFD and RT-PCR



Polemonium caeruleum, Jacob's Ladder

Virus Detected:

impatiens necrotic spot virus (INSV)

Detection Method:

Agdia INSV LFD



***Portulaca oleracea*, Yellow Moss Rose**

Virus Detected:

papaya mosaic virus (PapMV)

Detection Method:

ELISA conducted by Agdia, Inc.



Rheum rhabarbarum, Rhubarb

Virus Detected:

tobacco streak virus (TSV)

Detection Method:

RT-PCR and Sequencing



Rosa sp., Rose

Virus Detected:

undetermined potyvirus

Detection Method:

RT-PCR



***Rudbeckia fulgida*, Black-Eyed Susan, 'Little Goldstar'**

Virus Detected:

undetermined ilarvirus

Detection Method:

RT-PCR



Ruella simplex, Britton's Wild Petunia

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Sambucus sp., Elderberry, 'Yellow Leaf'

Virus Detected:

unknown virus – filamentous and spherical virus particles present

Detection Method:

Electron microscopy conducted by University of Minnesota, Plant Disease Clinic



***Scabiosa* sp., Pincushion Flower**

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Sedum sp., Stonecrop

Virus Detected:

cucumber mosaic virus (CMV)

Detection Method:

Agdia CMV LFD



Sedum sp., Stonecrop

Virus Detected:

undetermined potyvirus

Detection Method:

Agdia Poty LFD



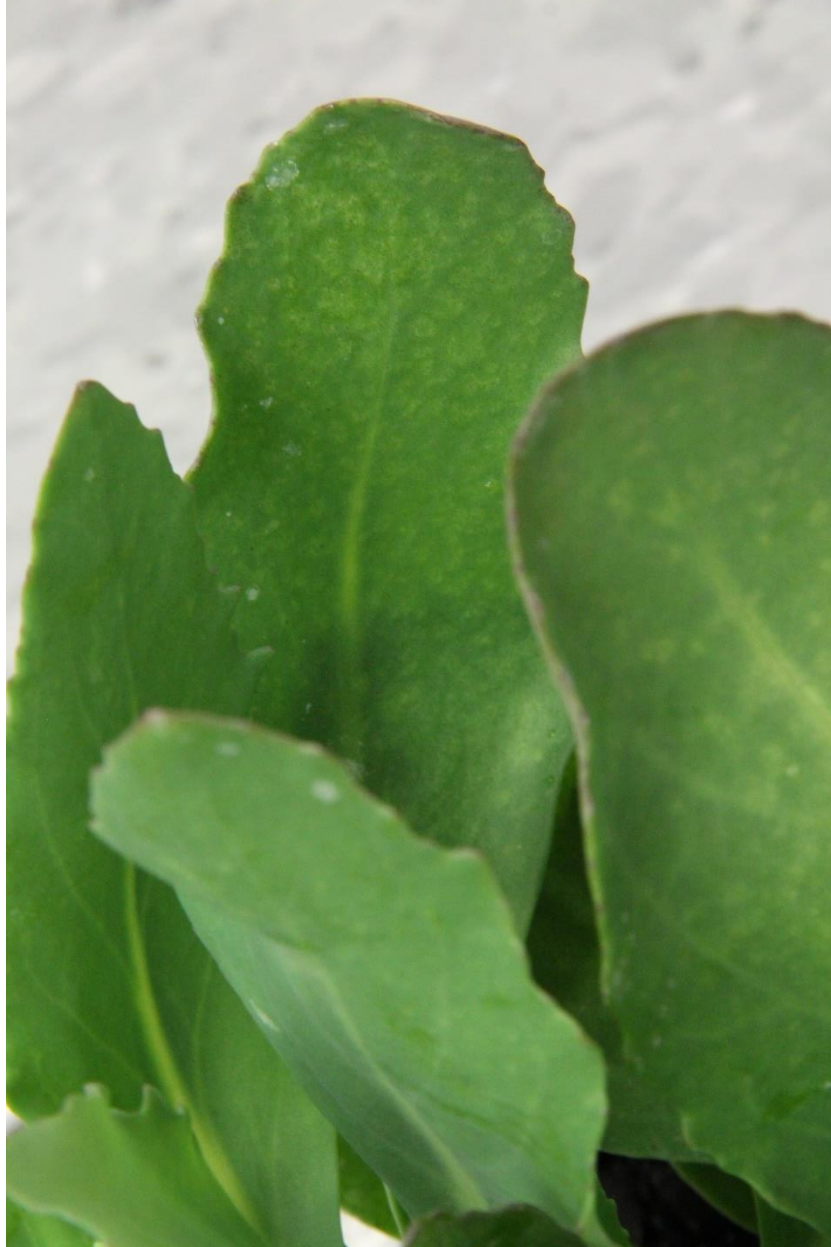
Sedum sp., Stonecrop

Virus Detected:

tobacco mosaic virus (TMV)

Detection Method:

Agdia TMV LFD



Sedum sp., Stonecrop

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Sedum sp., Stonecrop, 'Matrona'

Virus Detected:

kalanchoe mosaic virus (KMV)

arabis mosaic virus (ArMV)

Detection Method:

RT-PCR and sequencing, Agdia ArMV LFD



Sedum sp., Stonecrop, 'Strawberries and Cream'

Virus Detected:

undetermined potyvirus

Detection Method:

Agdia Poty LFD



Sidalcea sp., Prairie Mallow, 'Candy Girl'

Virus Detected:

undetermined potyvirus

Detection Method:

Agdia Poty LFD



Spiraea japonica, Spiraea

Virus Detected:

spirea yellow leafspot virus (SYLSV)
spirea leafspot spherical virus (SLSSV)

Detection Method:

Electron microscopy conducted by University of Minnesota, Plant Disease Clinic



Stokesia laevis, Stoke's Aster, 'Honeysong Purple'

Virus Detected:

impatiens necrotic spot virus (INSV)

Detection Method:

Agdia INSV LFD



Stylophorum diphyllum, Celandine Poppy

Virus Detected:

tobacco rattle virus (TRV)

undetermined ilarvirus

Detection Method:

RT-PCR



Stylophorum diphyllum, Celandine Poppy

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Syringa vulgaris, Lilac

Virus Detected:

lilac leaf chlorosis virus (LLCV)

Detection Method:

RT-PCR conducted by Dimitre Mollov USDA – ARS



Thermopsis sp., Carolina Lupine

Virus Detected:

clover yellow vein virus (CIYVV)

Detection Method:

RT-PCR and sequencing



***Tradescantia sp.*, Spiderwort, 'Concord Grape'**

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Tradescantia sp., Spiderwort, 'Concord Grape'

Virus Detected:

turnip mosaic virus (TuMV)

Detection Method:

RT-PCR and sequencing



Tradescantia sp., Spiderwort, 'Zwanenburg Blue'

Virus Detected:

undetermined potyvirus

Detection Method:

Agdia Poty LFD



Veronica sp., Speedwell, 'Icicle'

Virus Detected:

tobacco rattle virus (TRV)

Detection Method:

RT-PCR



Viburnum dentatum, Arrowwood

Virus Detected:

alfalfa mosaic virus (AMV)

Detection Method:

RT-PCR



Wisteria macrostachya, Wisteria, 'Aunt Dee'

Virus Detected:

wisteria vein mosaic virus (WVMV)

Detection Method:

RT-PCR and sequencing



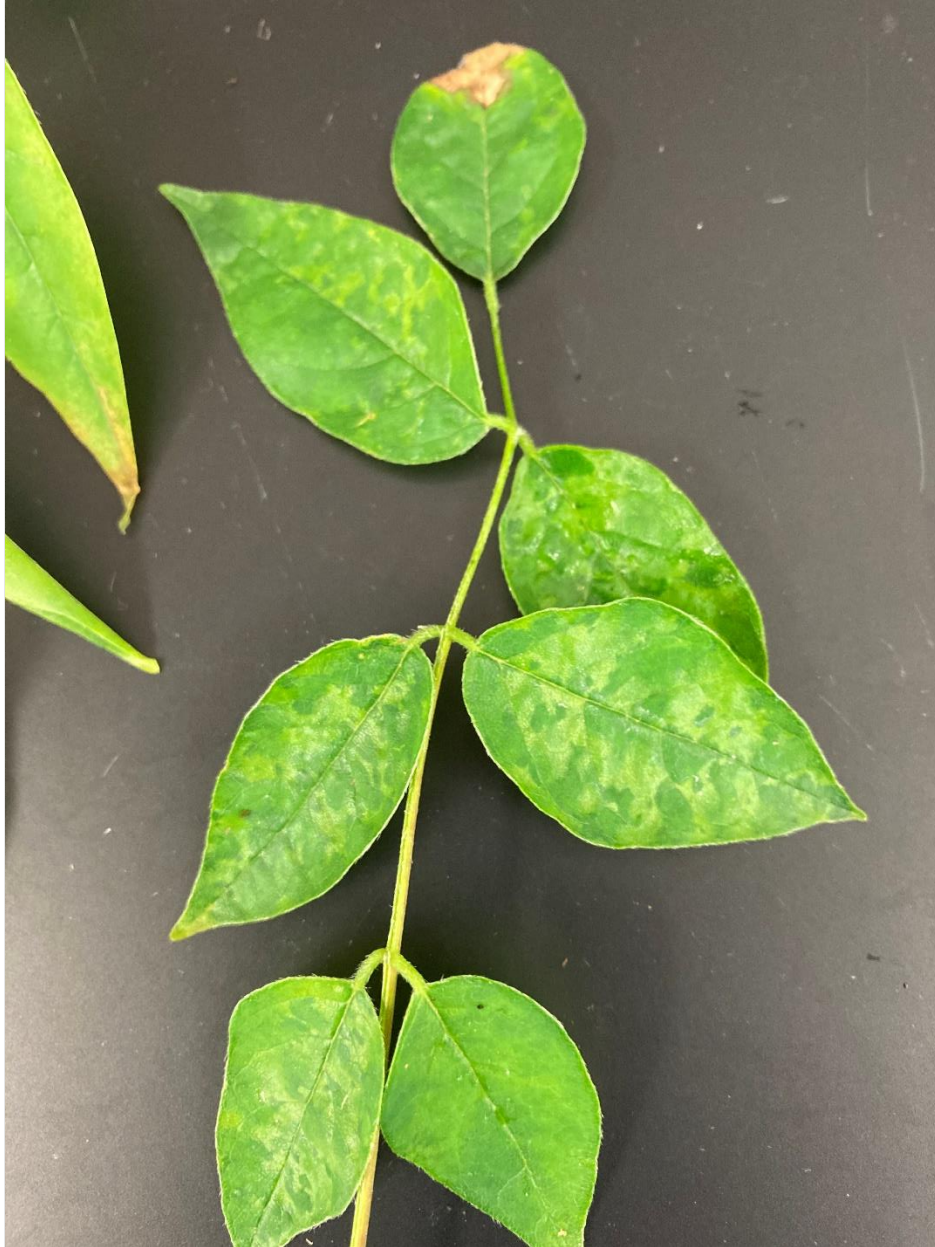
Wisteria sp., Wisteria

Virus Detected:

undetermined potyvirus

Detection Method:

Agdia Poty LFD



Wisteria sp., Wisteria

Virus Detected:

wisteria vein mosaic virus (WVMV)

Detection Method:

RT-PCR and sequencing



Zinnia sp., Zinnia, 'Uptown Sunstruck'

Virus Detected:

tomato spotted wilt virus (TSWV)

Detection Method:

Agdia TSWV LFD



Detection Method by Virus

Below is a list of the tests and sources used for all the viruses mentioned in the *Gallery*.

aconitum latent virus (AcLV)

Electron microscopy conducted at University of Minnesota, Plant Disease Clinic

alternanthera mosaic virus (AltMV)

ELISA conducted at Agdia, Inc.

alfalfa mosaic virus (AMV)

LFD, Agdia, Inc.

RT-PCR, Martínez-Priego, Ll., Córdoba, M. C., & Jordá, C. (2004). First report of alfalfa mosaic virus in *lavandula officinalis*. *Plant Disease*, 88(8), 908–908. <https://doi.org/10.1094/pdis.2004.88.8.908c>

arabis mosaic virus (ArMV)

LFD, Agdia, Inc

beet ringspot virus (BRSV)

Electron microscopy, RT-PCR, and sequencing conducted at University of Minnesota Plant Disease Clinic

bean yellow mosaic virus (BYMV)

RT-PCR and sequencing, Zheng, L., Rodoni, B. C., Gibbs, M. J., & Gibbs, A. J. (2010). A novel pair of universal primers for the detection of Potyviruses. *Plant Pathology*, 59(2), 211–220. <https://doi.org/10.1111/j.1365-3059.2009.02201.x>

canna yellow mottle virus (CaYMV)

RT-PCR, Pappu, H. R., Druffel, K. B., & Eastwell, K. C. (2008). Canna yellow mottle virus in canna spp. in Washington State. *Plant Disease*, 92(7), 1136–1136. <https://doi.org/10.1094/pdis-92-7-1136c>

canna yellow streak virus (CaYSV)

RT-PCR and sequencing, Zheng, L., Rodoni, B. C., Gibbs, M. J., & Gibbs, A. J. (2010). A novel pair of universal primers for the detection of Potyviruses. *Plant Pathology*, 59(2), 211–220. <https://doi.org/10.1111/j.1365-3059.2009.02201.x>

chili pepper mild mottle virus (CPMMoV)

TMV LFD, Agdia, Inc. Tobacco mosaic virus Agdia LFD known to cross react with CPMMoV.

clematis chlorotic mottle virus (CICMoV)

RT-PCR and Electron microscopy conducted at University of Minnesota, Plant Disease Clinic

clover yellow vein virus (CIYVV)

RT-PCR and sequencing Zheng, L., Rodoni, B. C., Gibbs, M. J., & Gibbs, A. J. (2010). A novel pair of universal primers for the detection of Potyviruses. *Plant Pathology*, 59(2), 211–220. <https://doi.org/10.1111/j.1365-3059.2009.02201.x>

cucumber mosaic virus (CMV)

LFD, Agdia, Inc.

RT-PCR, De Blas, C., Borja, M. J., Saiz, M., & Romero, J. (1994). Broad spectrum detection of cucumber mosaic virus (CMV) using the polymerase chain reaction. *Journal of Phytopathology*, 141(3), 323–329.

<https://doi.org/10.1111/j.1439-0434.1994.tb01476.x>

dahlia mosaic virus (DMV)

PCR, Nicolaisen, M. (2003). Partial molecular characterization of dahlia mosaic virus and its detection by PCR. *Plant Disease*, 87(8), 945–948. <https://doi.org/10.1094/pdis.2003.87.8.945>

dasheen mosaic virus (DsMV)

RT-PCR and sequencing, Zheng, L., Rodoni, B. C., Gibbs, M. J., & Gibbs, A. J. (2010). A novel pair of universal primers for the detection of Potyviruses. *Plant Pathology*, 59(2), 211–220. <https://doi.org/10.1111/j.1365-3059.2009.02201.x>

figwort mosaic virus (FMV)

RT-PCR, Elbeaino, T., Digiario, M., Alabdullah, A., De Stradis, A., Minafra, A., Mielke, N., Castellano, M. A., & Martelli, G. P. (2009). A multipartite single-stranded negative-sense RNA virus is the putative agent of Fig Mosaic Disease. *Journal of General Virology*, 90(5), 1281–1288. <https://doi.org/10.1099/vir.0.008649-0>

hosta virus X (HVX)

LFD, Agdia, Inc.

ilarvirus group

RT-PCR and Sequencing, Untiveros, M., Perez-Egusquiza, Z., & Clover, G. (2010). PCR assays for the detection of members of the genus ilarvirus and family Bromoviridae. *Journal of Virological Methods*, 165(1), 97–104. <https://doi.org/10.1016/j.jviromet.2010.01.011>

impatiens necrotic spot virus (INSV) (INSV)

LFD, Agdia, Inc.

iris severe mosaic virus (ISMV)

RT-PCR and sequencing, Zheng, L., Rodoni, B. C., Gibbs, M. J., & Gibbs, A. J. (2010). A novel pair of universal primers for the detection of Potyviruses. *Plant Pathology*, 59(2), 211–220. <https://doi.org/10.1111/j.1365-3059.2009.02201.x>

kalanchoe mosaic virus (KMV)

RT-PCR and sequencing, Zheng, L., Rodoni, B. C., Gibbs, M. J., & Gibbs, A. J. (2010). A novel pair of universal primers for the detection of Potyviruses. *Plant Pathology*, 59(2), 211–220. <https://doi.org/10.1111/j.1365-3059.2009.02201.x>

lilac leaf chlorosis virus (LLCV)

RT-PCR, James, D., Varga, A., Leippi, L., Godkin, S., & Masters, C. (2010). Sequence Analysis of RNA 2 and RNA 3 of lilac leaf chlorosis virus: A putative new member of the genus ilarvirus. *Archives of Virology*, 155(6), 993–998. <https://doi.org/10.1007/s00705-010-0673-5>

lily mottle virus (LMOV)

RT-PCR and sequencing, Zheng, L., Rodoni, B. C., Gibbs, M. J., & Gibbs, A. J. (2010). A novel pair of universal primers for the detection of Potyviruses. *Plant Pathology*, 59(2), 211–220. <https://doi.org/10.1111/j.1365-3059.2009.02201.x>

lily symptomless virus (LYLSV)

ELISA conducted at Ohio Department of Agriculture.

papaya mosaic virus (PapMV)

ELISA conducted at Agdia, Inc.

potato virus S (PVS)

RT-PCR and sequencing conducted by USDA – ARS.

potyvirus group

LFD, Agdia, Inc.

RT-PCR and sequencing, Zheng, L., Rodoni, B. C., Gibbs, M. J., & Gibbs, A. J. (2010). A novel pair of universal primers for the detection of Potyviruses. *Plant Pathology*, 59(2), 211–220. <https://doi.org/10.1111/j.1365-3059.2009.02201.x>

shamrock chlorotic ringspot virus (SCRV)

Electron microscopy, RT-PCR and sequencing conducted by University of Minnesota, Plant Disease Clinic

spiraea leafspot spherical virus (SLSSV)

Electron microscopy conducted by University of Minnesota, Plant Disease Clinic

spiraea yellow leafspot virus (SYLSV)

Electron microscopy conducted by University of Minnesota, Plant Disease Clinic

tobacco mosaic virus (TMV)

LFD, Agdia, Inc.

tobacco rattle virus (TRV)

RT-PCR, Robinson, D. J. (1992). Detection of tobacco rattle virus by reverse transcription and polymerase chain reaction. *Journal of Virological Methods*, 40(1), 57–66. [https://doi.org/10.1016/0166-0934\(92\)90007-z](https://doi.org/10.1016/0166-0934(92)90007-z)

tobacco streak virus (TSV)

RT-PCR and Sequencing, Untiveros, M., Perez-Egusquiza, Z., & Clover, G. (2010). PCR assays for the detection of members of the genus ilarvirus and family Bromoviridae. *Journal of Virological Methods*, 165(1), 97–104. <https://doi.org/10.1016/j.jviromet.2010.01.011>

tomato spotted wilt virus (TSWV)

LFD, Agdia, Inc

tomato ringspot virus (ToRSV)

LFD, Agdia, Inc

turnip mosaic virus (TuMV)

RT-PCR and sequencing, Zheng, L., Rodoni, B. C., Gibbs, M. J., & Gibbs, A. J. (2010). A novel pair of universal primers for the detection of Potyviruses. *Plant Pathology*, 59(2), 211–220. <https://doi.org/10.1111/j.1365-3059.2009.02201.x>

wisteria vein mosaic virus (WVMV)

RT-PCR and sequencing, Zheng, L., Rodoni, B. C., Gibbs, M. J., & Gibbs, A. J. (2010). A novel pair of universal primers for the detection of Potyviruses. *Plant Pathology*, 59(2), 211–220. <https://doi.org/10.1111/j.1365-3059.2009.02201.x>

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