VIRUSES

There are about 23 groups of plant viruses. Viruses are tiny parcels of RNA or DNA with a protein coat that invade plants, using the plant's cells for their reproduction. Typical symptoms of viral diseases include mottling, crinkling and discolouration of leaves, stems and flowers. Often the symptoms are striking and characteristic. Mosaic and ring spot patterns are common. Viruses may be spread by direct contact, such as handling or pruning, or by seed, insect vectors, and nematodes. Many viruses move systemically within the plant and some tissues may harbour the virus without showing symptoms.

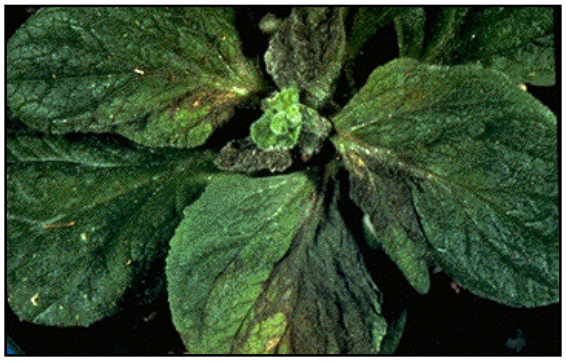
Impatiens Necrotic Spot Virus (INSV) & Tomato Spotted Wilt Virus (TSWV)

These viruses are very similar and cause many symptoms including stunting, leaf distortion, mosaic mottling of leaves, yellowing along veins, dead areas on leaves, wavy lines on foliage, concentric rings on foliage, flowers, fruit, and stems, and vein necrosis, puckering and burning of foliage similar to sun burn or chemical injury. As the symptoms can resemble many different diseases, the only reliable way to determine the presence of INSV/TSWV is through testing done at a laboratory.

INSV/TSWV are introduced into the greenhouse on infected propagation stock or by three species of thrips: *Frankliniella occidentalis* (Western flower thrips), *F. fusca*, and *Thrips tabaci* (onion thrips).

Many weeds such as chickweed, clovers, black medick, bittercress, shepherd's purse, sheep sorrel, bull thistle, Canada thistle, sow thistle and wood sorrel can be infected. If these INSV/TSWV infected weeds are near or in the greenhouse, thrips can transfer the virus to the crop. Weed control in an area at least five meters wide around the perimeter of the greenhouse as well as inside the greenhouse will reduce thrips and INSV/TSWV spread. Culled plants should be burned or buried and cull piles should not be allowed near greenhouses.

Impatiens Necrotic Spot Virus (INSV) of *Ranunculus*



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Impatiens Necrotic Spot Virus (INSV) of *Calceolaria*

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Tomato Spotted Wilt Virus of Chickweed

Impatiens Necrotic Spot Virus (INSV) of *Primula*

Impatiens Necrotic Spot Virus (INSV) of *Ranunculus*

Hosts

The total list is very long; the following are some of the more common hosts.

Antirrhinum (snapdragon)
Begonia
Calceolaria
Cyclamen
Dahlia
Chrysanthemum
Eustoma (lisianthus)
Exacum
Impatiens
Kalanchoe
Pelargonium (geranium)
Petunia
Primula
Ranunculus
Schefflera
Senecio (cineraria)
Sinningia (gloxinia)
Tagetes
Zantedeschia (calla)
Zinnia

Impatiens Necrotic Spot Virus (INSV) on *Begonia*

Impatiens Necrotic Spot Virus (INSV) on Tuberous *Begonia*

Begonia - INSV

Causes necrotic areas on leaves, mosaic patterns, concentric rings, stem necrosis, vein necrosis, stunting, puckering and burning of foliage similar to sun burn or chemical injury.

Tomato Spotted Wilt Virus (TSWV) on *Chrysanthemum*

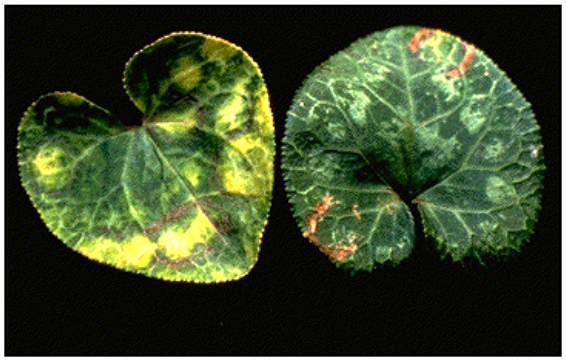
Chrysanthemum - TSVW

Stems develop spots, and leaves collapse, turn brown, and die. Plants appear blighted, and may seem to be infected with Fusarium.

Tomato Spotted Wilt Virus (TSWV) on *Chrysanthemum*

Cyclamen - INSV

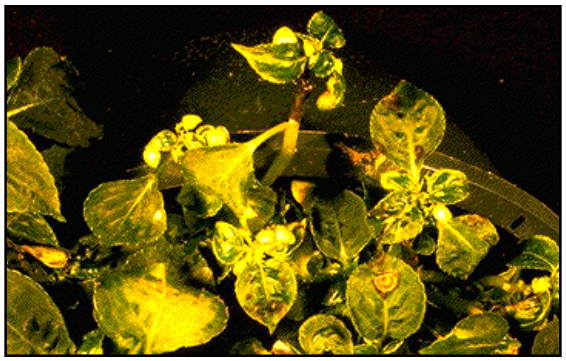
Causes necrotic leaf spots and vein necrosis. Lesions initiated at the base of the leaf blade may radiate along several veins causing an oak-leaf pattern. Chlorotic leaf lesions develop into necrotic spots or concentric rings. Leaf collapse can result from petiole necrosis or coalescence of numerous ringspots. Symptoms are generally seen only at temperatures between 13°C and 22°C.



Impatiens Necrotic Spot Virus (INSV) on *Cyclamen*

Impatiens - INSV

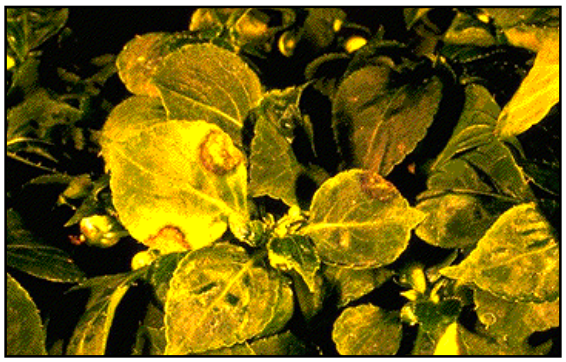
Causes local spots that include ring spots and papery necrotic areas on leaves. The virus becomes systemic and causes faint purplish ring patterns, mottling on new leaves, and aborted growing points. Black lesions may appear on stems. Some stems dieback and in severe cases, the host dies. Hosts may have only a few leaves with symptoms with the majority of leaves showing nothing.



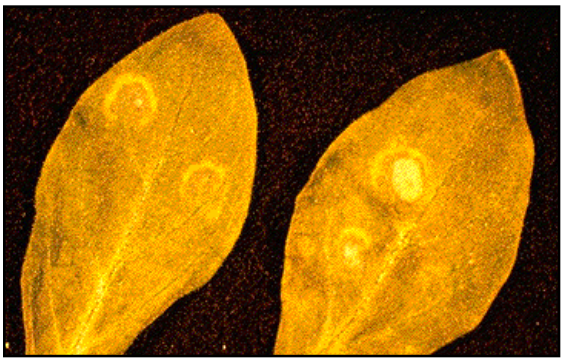
Impatiens Necrotic Spot Virus (INSV) on *Impatiens*

Petunia - INSV

Seen as light coloured spots surrounded by a pale ring. Petunias are good indicator plants because of their typical and easily identifiable symptoms.



Impatiens Necrotic Spot Virus (INSV) on *Impatiens*



Impatiens Necrotic Spot Virus (INSV) on *Petunia*

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Impatiens Necrotic Spot Virus (INSV) on New Guinea Impatiens

Senecio - INSV

Young plants develop symptoms resembling Phytophthora root rot. (See Root and Crown Rot - Phytophthora, Phytophthora Diseases.) The base and central part of lower leaves darkens and plants collapse. Older plants develop ring spots and line patterns on leaves. Dark purple to brown sunken lesions develop on petioles, frequently at the leaf junction. The petiole may be girdled or the lesions may move into the stem.

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Impatiens Necrotic Spot Virus (INSV) of *Senecio*

Impatiens Necrotic Spot Virus (INSV) of *Senecio*

Sinningia - INSV

Brown-ringed, spot-like markings of dead tissue, the centres of which may remain green. Leaves show vein necrosis and ringspots. On young plants, the crown may become soft, brown and water-soaked similar to phytophthora crown rot. (See Root and Crown Rot - Phytophthora.)

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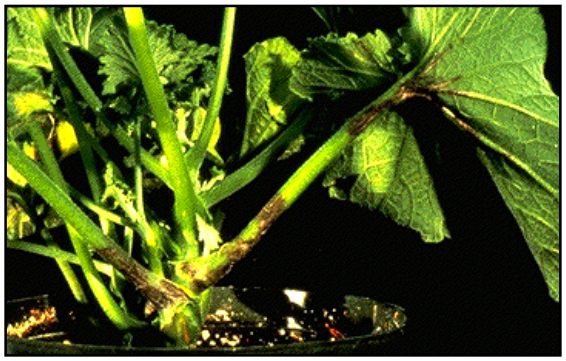
Sinningia with Impatiens Necrotic Spot Virus (INSV) Ring Spots



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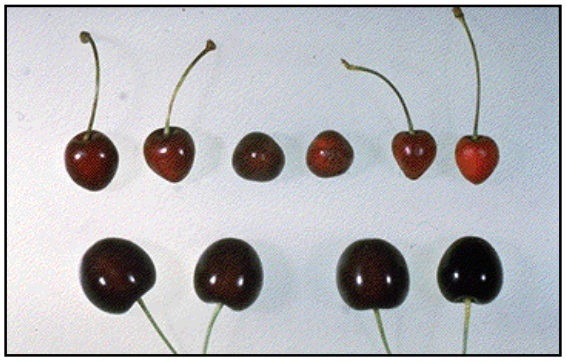
Impatiens Necrotic Spot Virus (INSV) of *Senecio*

Sinningia with Impatiens Necrotic Spot Virus (INSV) Ring Spots

Other Viruses

Little Cherry Disease Virus

Delays ripening of fruit, and causes black cherries to have small pointed, pinkish coloured fruits with a bitter flavour. On sour cherries, fruits are small, and yellowish-pink. Some varieties develop reddish-purple leaves in early fall. Virus may be spread by the apple mealybug, or by budding and grafting. Only certified virus-free stock should be used.



Little Cherry Disease & Normal Cherries

Iris - Mosaic Virus

Stunting, yellow tissues or yellow patches are typical symptoms. In flowers, dark teardrop markings as well as clear feather-like markings appear. Fewer and smaller bulbs are produced from infected plants. Aphids readily spread the virus.

R. Byther

Iris Mosaic Virus

R. Byther

Iris Mosaic Virus

R. Byther

Iris Mosaic Virus

R. Byther

Iris Mosaic Virus Flower Break

Aster Yellows

This mycoplasma problem is first seen as a pale yellowish tinge on the leaves, causing them to eventually die. Blooms, if present, are off colour and misshapen with yellowish green rays. Plants are stunted, but with many shoots, a condition known as witches' broom.

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Tagetes with Aster Yellows

Rosa - Mosaic Virus

Symptoms are best seen in spring on leaves as chlorotic zigzag line patterns, ring spots, and mottles, and sometimes as yellow net and yellow mosaic patterns. Flowers are not affected.

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Aster with Aster Yellows

Mosiac Virus of *Rosa*